4th Grade

(1) Within a well-balanced mathematics curriculum, the primary focal points are comparing and ordering fractions and decimals, applying multiplication and division, and developing ideas related to congruence and symmetry.

(2) Throughout mathematics in Grades 3-5, students build a foundation of basic understandings in number, operation, and quantitative reasoning; patterns, relationships, and algebraic thinking; geometry and spatial reasoning; measurement; and probability and statistics. Students use algorithms for addition, subtraction, multiplication, and division as generalizations connected to concrete experiences; and they concretely develop basic concepts of fractions and decimals. Students use appropriate language and organizational structures such as tables and charts to represent and communicate relationships, make predictions, and solve problems. Students select and use formal language to describe their reasoning as they identify, compare, and classify two- or three-dimensional geometric figures; and they use number, standard units, and measurement tools to describe and compare objects, make estimates, and solve application problems. Students organize data, choose an appropriate method to display the data, and interpret the data to make decisions and predictions and solve problems.

(3) Throughout mathematics in Grades 3-5, students develop numerical fluency with conceptual understanding and computational accuracy. Students in Grades 3-5 use knowledge of the base ten place value system to compose and decompose numbers in order to solve problems requiring precision, estimation, and reasonableness. By the end of Grade 5, students know basic addition, subtraction, multiplication, and division facts and are using them to work flexibly, efficiently and accurately with numbers during addition, subtraction, multiplication, and division.

(4) Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning underlie all content areas in mathematics. Throughout mathematics in Grades 3-5 students use these processes together with technology and other mathematical tools such as manipulative materials to develop conceptual understanding and solve meaningful problems as they do mathematics.

(4.1) Number, operation, and quantitative reasoning. The student uses place value to represent whole numbers and decimals.

4.1(A) use place value to read, write, compare, and order whole numbers through 999,999,999

Include:

* Convert from standard to written (digits to words)
* Convert from written to standard (words to digits)
* Record numbers in expanded notation (Ex. 357 = 300 + 50 + 7)
* Describe place and value (such as 31,465 – the four is in the hundreds place and the value is 400)
* Use symbols and words for “greater than” (>) and “less than” (<) and equal to (=)
* Compare and order groups of numbers
* Sequence numbers/words such as populations and names of cities from least to greatest
* Include non-examples - "which of these does NOT make the sentence true? -- What could you do to make this true? --Why is this not true?

Helpful manipulatives:

*Base ten pieces, place value charts

4.1(B) use place value to read, write, compare, and order decimals involving tenths and hundredths, including money, using concrete objects and pictorial models

Include:
* Numbers and groups of numbers
* Words
* Tables (vertical and horizontal) that include data in various orders (descending, ascending, and no order)
* Number lines
* Money (relate concept of $1.00, $0.10, $0.01)
* Concrete models
* Pictorial models
* Use symbols (>), (<) and (=)
* Include equivalent decimals 0.1 = 0.10 concrete objects and pictorially
* Compare a variety of whole numbers from 999,999,999 to numbers as small as hundredths

Helpful manipulatives:
* Base ten pieces are commended for understanding; money (coins and dollars)

Note:
Decimals are introduced in 4th grade.

(4.2) Number, operation, and quantitative reasoning. The student describes and compares fractional parts of whole objects or sets of objects.

4.2(A) use concrete objects and pictorial models to generate equivalent fractions

Include:
* Students generate a pattern of concrete fractions
* Students explain the relationship between the concrete patterns
* Students record the abstract fractions after the relationship is understand
* Solve problems/compare pairs of fractions and recognize equivalent fractions in simplest form.
* Use non-examples (3/4 does not equal 1/2)

Helpful manipulatives:
* Tiles, pattern blocks, fraction bars, Cuisenaire rods

Note:
* Students need to relate the pictorial model to the abstract number (such as a pizza may show 4/8 colored and the answer may be (1/2).
* In the representation of one whole (ex. one whole circle) shaded fractional divisions do not have to be adjacent.

4.2(B) model fraction quantities greater than one using concrete objects and pictorial models

Include:
* Recognize objects greater than one concretely and pictorially

Vocabulary:
* numerator and denominator, whole numbers, improper fractions (fractions greater than 1 ex. 8/5) , proper fractions, and mixed numbers

Helpful manipulatives:
* tiles, pattern blocks, Cuisenaire rods, fraction strips

Note:
Students must model using concrete objects and draw the pictorial.

4.2(C) compare and order fractions using concrete objects and pictorial models

Include:
* Fractions equal to, less than, and greater than one whole
* Compare 2 fractions w/ symbols <, >, =
* Recognize simplest forms of fractions

Vocabulary:
* numerator and denominator, simplest form

Note:
Students must move from the concrete to the pictorial to the abstract numbers.

4.2(D) relate decimals to fractions that name tenths and hundredths using concrete objects and pictorial models

Include:
* Symbols such as 1/10, 0.1
* Record models and pictures
* Students should demonstrate 1/10 is the same value as 0.1 and 1/100, 0.01 (explain by using place value)
* Relate fractions to decimals (ex. 1/2 to 0.5 to 0.50)

Helpful manipulatives:
*Base Ten Pieces for understanding, place value mats, number lines, fraction bars, color tiles, money

Note:
* Decimals are introduced in 4th grade.

(4.3) Number, operation, and quantitative reasoning. The student adds and subtracts to solve meaningful problems involving whole numbers and decimals.

4.3(A) use addition and subtraction to solve problems involving whole numbers

Include:
* Addition and subtraction need to be taught together in problem solving situations
* Use pictures, words, and numbers together build the concepts
* Work with fact families
* Include number sentences - 5 + ___ = 8

Helpful manipulatives:
*Base 10 pieces

Examples of three kinds of problems that address subtraction:
* Take away (John had 5 pieces and gave Sue 2. How many did he have left?)
* Comparison (John has 5 pieces and Sue has 2. How many more does John have than Sue?)
* Partition - (John has 8 cookies and he puts 5 in the lunch box. How many did he not put in the lunch box?)

Levels of difficulty from easiest to hardest:
5 - 3 = _____ Result unknown - John has 8 toys and he gives Sue 5 toys. How many toys does John have now?
5 - __ = 2 Change unknown - John had 8 toys, he gave some away and now he only has two toys. How many did he give away?
__ - 3 = 5 Start unknown - John had some toys, he gave 3 away and now he has 5 toys. How many toys did John have in the beginning?

4.3(B) add and subtract decimals to the hundredths place using concrete objects and pictorial models

Include:
* Students must build concrete objects, draw pictorial models, and connect the abstract numbers
* Apply addition/subtraction concepts

Note:
* Adding and subtracting decimals are introduced in 4th grade.

(4.4) Number, operation, and quantitative reasoning. The student multiplies and divides to solve meaningful problems involving whole numbers.

4.4(A) model factors and products using arrays and area models

Include:
* Using vocabulary such as factors, products, dimensions, and area
* Concrete to pictorial to abstract instruction must be made with area models or arrays.

Helpful manipulatives:
* Arrays, unifix cubes, tiles, base 10 pieces, cm grid paper, linear pieces

4.4(B) represent multiplication and division situations in picture, word, and number form

Include:
* Create number sentences and relate to the fact families
* Apply multiplication/division concepts
* Journaling should explain the process
* Build from the concrete to the pictorial to the abstract number

Vocabulary:
* Factors, multiples, quotient, product

Helpful manipulatives:
* Tiles, linear pieces, base 10 pieces

Note:
* This TEKS is sometimes tested with bubbles on a grid.

4.4(C) recall and apply multiplication facts through 12x12

Include:
* Learn and apply multiplication facts (fact families), and extend fact families to include related factors (ex. 6 x 2 = 12 and 2 x 6 = 12 relate to 3x4 = 12 and 4 x 3 = 12)

Vocabulary
* Factors, multiples, products

Helpful manipulatives:
* Arrays, tiles, base 10 pieces

Note:
* Timed tests should be designed to allow students to increase their own time.
* 4th grade is held accountable for "recalling" the multiplication facts.

4.4(D) use multiplication to solve problems (no more than two-digits times two-digits without technology)

Include:
* Apply multiplication/division concepts
* Process through the representations: concrete/pictorial/abstract

Helpful manipulatives:
• Concrete manipulatives for understanding concept of multiplication, base 10 pieces, grid paper

Note:
* This TEKS is sometimes tested as bubbles on a grid.

4.4(E) use division to solve problems (no more than one-digit divisors and three-digit dividends without technology)

Include:
* Students build concrete models w/ and w/out remainders
* Students draw a representation of the model
* Students move to the abstract numbers from the concrete models and pictorial drawings

Vocabulary:
* divisor, dividend, remainder, quotient

Helpful manipulatives:
* Concrete manipulatives for understanding concept of division, tiles, base 10 pieces

Note:
* The first time remainders are mentioned is 5.3 C "remainders" are interpreted. Fourth grade may have remainders such as 124 ÷ 3 = 41 remainder 1.

(4.5) Number, operation, and quantitative reasoning. The student estimates to determine reasonable results.

4.5(A) round whole numbers to the nearest ten, hundred, or thousand to approximate reasonable results in problem situations

Include:
* Teach within word problems
* Single digit numbers are not rounded
* Use the situation in the problem to determine the rounding strategy. Such as:
    * front end estimation (237-46 would be 200-50)
    * for addition of two numbers and subtraction round to the highest place value of the smallest number used in computation (237-46 would be 240-50)
    * In multiplication and division round to the highest place value of each number (e.g. front end estimation)

Helpful manipulatives:
* Base 10 pieces, number lines

Note:
* Problems may include information expressed as a range of numbers
* Include rounding and reasonableness in solving problems - students should use rounding to estimate before solving problems.
* Students should justify their answers.
* There are no definite rules for rounding in all situations. Students need to practice rounding using different strategies and be able to determine which place value to round based on the real life situation.

4.5(B) use strategies including rounding and compatible numbers to estimate solutions to multiplication and division problems

Include:
* Round numbers before computation
* Use compatible numbers
* Work with examples of real-life estimation

Vocabulary:
*Compatible numbers (new skill) are “numbers that are easy to compute mentally.”
For example:
• 25 + 46 + 75...think (25 + 75) + 46; which would be 100 + 46
• 78 + 96 can be computed as 75 + 100 or 78 + 100
• 4,126 ÷ 8 - think 4,000 ÷ 8 = 500

Helpful manipulatives:
* Concrete manipulatives for understanding, base 10 pieces

Note:
Compatible numbers do not always end in a zero.

4.6 Patterns, relationships and algebraic thinking. The student uses patterns in multiplication and division.

4.6(A) use patterns and relationships to develop strategies to remember basic multiplication and division facts (such as the patterns in related multiplication and division sentences (fact families) such as 9x9=81 and 81÷9=9

Include:
* Equations
* Real-life application
* Journal fact families - students include explanations on fact families
* Relate all factors to the product

Helpful manipulatives:
* Snap cubes, tiles, base ten pieces

4.6(B) use patterns to multiply by 10 and 100

Include:
* Find patterns using multiple representations.
  * Tables
  * Bar graphs
  * Concrete/pictorial/abstract
  * Real-life application
  * Word problems
  * "T" charts

Helpful manipulatives:
* Tiles, base ten pieces, grid paper

Note:
*Students need to identify the relationship between paired numbers -

Ex.	Boxes candy	Pieces of candy	
	3	30	each box of candy has 10 pieces.
	8	80	
	10	100	

* Students should find patterns using multiple representations.

(4.7) Patterns, relationships, and algebraic thinking. The student uses organizational structures to analyze and describe patterns and relationships.

4.7 Describe the relationship between two sets of related data such as ordered pairs in a table

Include:
* Pictorial models
* Journal writing describing patterns
* Concrete/pictorial/abstract
* Real-life application

Helpful manipulatives:
* Sets of objects, arrays, tiles, T charts, base ten pieces

Note:
* Identify relationship between paired numbers (ordered pairs are numbers that appear in tables or with parenthesis, paired numbers do not necessarily have to appear in a table.
* Tables may not begin with the number "1"or be in numerical order, ex. 3, 6, 9, 12.
* Assessment may be over the process for finding the solution (journal writing is a must).

(4.8) Geometry and spatial reasoning. The student identifies and describes lines and attributes of geometric figures using formal geometric language.
4.8(A) identify and describe right, acute, and obtuse angles **Include:** * Only degree taught at 4th grade (90°) * Journal writing-form definitions with attributes * Include concrete examples * Use pictorial representations * Real world application **Helpful manipulatives:** * Geoboards, tangrams, pattern blocks **Note:** * This is concept is introduced in 4th grade.
4.8(B) identify and describe parallel and intersecting (including perpendicular) lines using concrete objects and pictorial models; **Include:** * Journal writing-form definitions with attributes (such as perpendicular lines are two lines which intersect forming 90 degree angles) * Concrete examples * Pictorial representations * Real world application **Helpful manipulatives:** *Geoboards, pattern blocks, tangrams **Note:** * This concept is introduced in 4th grade.

4.8(C) use essential attributes to define two- and three-dimensional geometric figures

Include:
Two dimensional figures:
• Vertices, sides, and faces
Three dimensional figures:
• Vertices, edges, faces
Vocabulary:
• Two-dimensional vocabulary (circle, polygon, triangle, square, rectangle, quadrilateral, rhombus, trapezoid, parallelogram, pentagon, hexagon, octagon, side, vertex)
• Three-dimensional vocabulary (sphere, cone, cylinder, cube, rectangular prism, triangular prism, square pyramid, triangular pyramid, vertex, edge, face, base)
Helpful Manipulatives:
1) Pattern blocks
2) Tangrams
3) Geoboards
4) 3-D geometric shapes
5) Everyday items
Note:
* Teacher should state attributes of an object and students pick an object from a group of items.

(4.9) Geometry and spatial reasoning. The student connects transformations to congruence and symmetry.

4.9(A) demonstrate translations, reflections, and rotations using concrete models

Include:
* Translations include up-down and left -right, diagonal
* Journal writing-form definitions with attributes
* Pictorial representations on geoboard grid paper of a 90 degree rotational turn, reflections, and translations
* Real world application
Helpful manipulatives:
* Geoboards, tangrams, pattern blocks
Note:
* This concept is introduced in 4th grade.

4.9(B) use translations, reflections, and rotations to verify that two shapes are congruent

Include:
* Journal writing-form definitions with attributes
* Pictorial representations on geoboard grid paper
* Real life application

Vocabulary:
* congruent

Helpful manipulatives:
• Geoboards, pattern blocks, tangrams

Note:
***This concept is introduced in 4th grade.

4.9(C) use reflections to verify that a shape has symmetry

Include:
* Identify vertical, horizontal and diagonal lines of symmetry
* Pictorial representations on geoboard grid paper
* Include shapes with more than one line of symmetry
* Work with real-life applications

Vocabulary:
* Horizontal, diagonal, vertical, and symmetrical

Helpful manipulatives:
* Tangrams, geoboards, miras (plastic reflection devices) or mirrors, pattern blocks

Note:
Reflection is introduced in 4th grade.

(4.10) Geometry and spatial reasoning. The student recognizes the connection between numbers and their properties and points on a number line.

4.10 Locate and name points on a number line using whole numbers, fractions such as halves and fourths, and decimals such as tenths

Include:
* Number lines do not always begin with "0"
* Concept of points on a line
* Pictorial representations
* Whole numbers, halves, and fourths
* Decimals of tenths (1/10 = 0.1)

Note:
* A ruler is considered a number line; “fractions such as halves and fourths” implies rulers will be tested up to “halves and fourths” Clocks, gauges and thermometers are also number lines.
* Decimals on a number line are introduced in 4th grade.

(4.11) Measurement. The student applies measurement concepts. The student is expected to estimate and measure to solve problems involving length (including perimeter) and area. The student uses measurement tools to measure capacity/volume and weight/mass.

4.11(A) estimate and use measurement tools to determine length (including perimeter), area, capacity and weight/mass using standard units, SI (metric) and customary.

Include:

* Measurement should be hands-on application
* Include and make the connections between the representations: concrete, pictorial, abstract,
* Metric units of measurement
* Customary units of measurement
* Area and perimeter
* Arrays with tiles
* Linear lines for dimensions

Length

* Inches, feet, yards
* Centimeter, meter, kilometer

Capacity

* Cups, pints, quarts, gallons
* Milliliters, liters

Mass/weight

* Ounces, pounds (weight - use scales)
* Grams, kilograms (mass - use balance)

4.11(B) perform simple conversions between different units of length, between different units of capacity, and between different units of weight within the customary measurement system;

Include:
* Estimate first
* Measurement should be hands-on application; provide students common items for developing concepts
* Customary (inch, foot, yard, mile)
* Capacity - amount object holds; weight - gravitational pull on an object
* Use conversion of customary measurements (e.g. 6 inches and 1/2 foot) in problem solving

1 foot = 1/3 yard
1 inch = 1/12 foot
1 quart = ¼ gallon
1 pint = ½ quart
1 cup = ½ pint
1 ounce = 1/8 cup
1 ounce = 1/16 pound
3 ft = 1 yard
4 qts = 1 gallon
8 oz - 1 cup

Note:
Conversion of customary is introduced in 4th grade.

4.11(C) use concrete models of standard cubic units to measure volume

Include:
* Concrete models should include cubes and blocks

Note:
* Volume is tested in cubic units.
* Students are responsible for counting cubes and this can be tested with pictorial models.

4.11(D) estimate volume in cubic units

Include:
* Estimate before actually finding the volume through exploration
* Use linking cubes, foam cubes, wooden cubes etc.

Note:
* Students are responsible for counting cubes and this can be tested with pictorial models.
* Volume will only be assessed with cubic units.

4.11(E) explain the difference between weight and mass

Include:
Weight
* Weight is the gravitational pull on an object
* Customary units of measurement are used such as ounces, pounds, and tons
* Scales are used in measuring weight
Mass
* Mass is the amount of matter something contains
* Metric units of measurement are used such as grams and kilograms
* A balance is used in measuring
Note:
The **difference** between weight and mass is introduced in 4th grade.

(4.12) Measurement. The student applies measurement concepts. The student measures time and temperature (in degrees Fahrenheit and Celsius).

4.12(A) use a thermometer to measure temperature and changes in temperature

* Students measure/hands-on with thermometers
Vocabulary:
* increase, decrease, drop, rise
Note:
Celsius is introduced in 4th grade.

4.12(B) use tools, such as a clock with gears or a stopwatch, to solve problems involving elapsed time

Include:
* Students solve problems using clocks with gears, etc.
* Include both analog and digital clocks
* Elapsed time -- "How long was the party? Our party started at 2:00 and was over at 4:30. The amount of elapsed time is 2 hours and 30 minutes.
* Range of time -- students will be asked to choose the clock that is in between 2:00 and 2:30 (between a range of time.)
* May use "T" charts to record

Note:
Elapsed time is introduced in 4th grade.

Note: 4th grade measures:
* Conversion with customary only (4.11B)
* Measures in metric and customary (4.11A)
* Fahrenheit & Celsius (4.12)

(4.13) Probability and statistics. The student solves problems by collecting, organizing, displaying, and interpreting sets of data.

4.13(A) use concrete objects or pictures to make generalizations about all possible combinations of a given set of data or of objects in a problem situation

Include:
* Diagrams and lists
* Pictorial is imperative
* Determine data appropriate/accurate

Helpful manipulatives:
* Random number generators/number cubes, spinners, calculators or computers

Note:
* This concept is introduced in 4th grade.

4.13(B) interpret bar graphs

Include:
* Pictographs and bar graphs
* Graphs read vertically and horizontally
* Children need to complete portions of graph
* Interpret graph by combining information on graph

Must construct graphs by:
* Collecting data
* Organizing data
* Recording data
* Displaying data

(4.14) Underlying processes and mathematical tools. The student applies mathematics to solve problems connected to everyday experiences and activities in and outside of school.

4.14(A) identify the mathematics in everyday situations

Note:
* Objective 6 is tested in all strands.
* Engage the students with real life experiences.
* Students should not only solve problems, but create problems when given mathematical expressions

4.14(B) solve problems that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness

Include:
* Explore problems using concrete manipulatives
* Draw a picture (pictorial)
* Share thoughts with peers
* Create questions
* Journal thoughts
* Record or communicate with words/pictures/numbers
* Justify answer

4.14(C) select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem

Include:
* Explore with concrete manipulatives
* Draw a picture (pictorial)
* Share thoughts with peers
* Journal thoughts
* Record or communicate with words/pictures/numbers
* Justify answer

Note:
* This is tested in other strands...such as:
  Student assesses necessary information to solve problems
  Missing information or sequence of steps (process)
  What is the "known" and "unknown" of the problem?
* Make sure students process from concrete to pictorial to written computation.

4.14(D) use tools such as real objects, manipulatives, and technology to solve problems

Include:
* Explore with concrete manipulatives
* Draw a picture (pictorial)
* Share thoughts with peers
* Journal thoughts
* Numerical representation
* Justify answer
* Work with and make connections among the different representations: concrete/pictorial/abstract
* Use calculators

(4.15) Underlying processes and mathematical tools. The student communicates about mathematics using informal language.

(4.15A) explain and record observations using objects, words, pictures, numbers, and technology

Include:
* Describe the process in words (written and/or orally)
* Journal writing/drawing is imperative
* Oral explanation is a must
* Calculators

Note:
* This is tested in other objectives. Solutions to problems may include the solution process in words.

4.15(B) relate informal language to mathematical language and symbols **Include:** * Students write and understand words, numbers, and symbols * Journal writing is imperative * Oral explanation is a must (students should talk to other students, the teacher, and to the class) **Note:** * This is tested in other objectives.
(4.16) Underlying processes and mathematical tools. The student uses logical reasoning to make sense of his or her world.
4.16(A) make generalizations from patterns or sets of examples and non examples **Include:** * Identify attributes of examples * Identify examples false to statement given * Examples may have nonsense words
4.16(B) justify why an answer is reasonable and explain the solution process **Include:** * Students justify and prove their solutions in written/spoken words, pictures, concrete objects, and/or numbers * Journal writing (may include process or explanation, etc.) * Peer explanations * Classroom discussions