Fourth Grade Math

Overview of Goals for Standards for Mathematical Practice

The Standards for Mathematical Practice describe skills and behaviors that all students should be developing in their particular grades. These practices include important processes (ways of doing things) and proficiencies (how well we do things), including problem solving, reasoning and proof, communication, representation, and making connections. These practices will allow students to understand and use math with confidence. Following is what children will be working to be able to do with increasing ease:

Make sense of problems and persevere in solving them
- Find the meaning in problems
- Analyze, predict, and plan the path to solve a problem
- Verify answers
- Ask themselves the question: "Does this make sense?"

Reason abstractly and quantitatively
- Be able to translate the meaning of each math term in any equation
- Interpret results in the context (setting) of the situation

Construct arguments and evaluate the reasoning of others
- Understand and use information to build arguments
- Make and explore the truth of estimates and guesses
- Justify conclusions and respond to arguments of others

Model with mathematics
- Apply math to problems in everyday life
- Identify quantities (amounts, numbers) in a practical situation
- Present, show, or explain the problem and solution in an understandable way

Use appropriate tools strategically
- Consider the available tools when solving problems, and know which tool is most appropriate in the situation
- Be familiar with tools appropriate for their grade level or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content on a website, and other technological tools)

Be precise
- Be able to communicate accurately with others
- Use clear definitions, state the meaning of symbols, and be careful when specifying units of measure and labeling axes (the "x" and "y" lines that cross at right angles to make a graph) in math figures
- Calculate accurately and efficiently

Look for and make use of structure
- Recognize patterns and structures
- Step back to find the big picture and be able to shift perspective
- See complicated things as single objects, or as being made up of several objects

Look for and identify ways to create shortcuts when doing problems
- When calculations are repeated, look for general methods, patterns, and shortcuts
- Be able to evaluate whether an answer makes sense

The major domains included in the math standards for Grades K-5 are listed below. In each grade, students build on what they learned previously to form a progression of increasing knowledge, skill, or sophistication.

MAJOR DOMAINS FOR MATH STANDARDS	GRADE					
	KINDERGARTEN	1	2	3	4	5
Counting and Cardinality	✓					
Operations and Algebraic Thinking	✓	✓	✓	✓	✓	✓
Numbers and Operations – Base Ten	✓	✓	✓	✓	✓	✓
Numbers and Operations – Fractions				✓	✓	✓
Measurement and Data	✓	✓	✓	✓	✓	✓
Geometry	✓	✓	✓	✓	✓	✓

Fourth Grade Math

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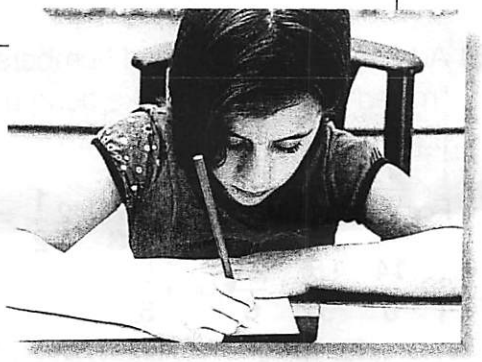
Focus Clusters for Fourth Grade – in fourth grade, teachers will focus instruction on these areas:

- Extend understanding of fraction equivalence and ordering.
- Build fractions from unit fractions by applying and expanding previous understanding of operations of whole numbers.
- Use the four operations with whole numbers to solve problems.
- Generalize place value understanding for multi-digit whole numbers.

Skills that focus on these areas appear in the shaded box below. While these skills are priority areas, students will be learning all of the skills listed in the following sections.



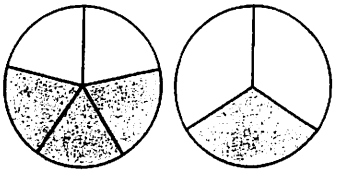
For fourth graders, the math standards expect the following skills to be developing, so that a student can say, "I can … **(insert math goal)**," for example, I can **explain why one fraction is equal to another**." Help your child develop skills in these areas:

Numbers and Operations – Fractions

- Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) (n being any number) by using visual fraction models. $\frac{3 \times 6}{3 \times 8} = \frac{18}{24} = \frac{6}{8}$ Multiplying by the same number in the numerator (top or first number) and denominator (bottom or second number) gives the same fraction. For example, (3 x a) / (3 x b) or (12 x a) / (12 x b) gives the same fraction as a/b.

- Compare two fractions with different numerators and different denominators by creating common denominators or numerators. For example, to see if $\frac{3}{8}$ is = (equal to), < (less than), or > (more than) $\frac{6}{12}$, change the denominators of each fraction to the same number (in this case, **24**). The new fractions would become $\frac{9}{24}$ (8 into 24 = 3, multiply the numerator (3) by 3) and $\frac{12}{24}$ (12 into 24 = 2, multiply numerator (6) by 2). Since 12 is more than 9, $\frac{9}{24}$ is less than (<) $\frac{12}{24}$, so $\frac{3}{8} < \frac{6}{12}$.

■ Compare two fractions to a benchmark fraction, like $\frac{1}{2}$ or $\frac{1}{3}$. Be able to use a visual fraction model. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.



$\frac{3}{5}$ > $\frac{1}{3}$

Benchmark fractions are common fractions that you can judge other numbers against. Often, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and often $\frac{1}{10}$ (because of its relationship with decimals) are referred to as benchmark fractions.

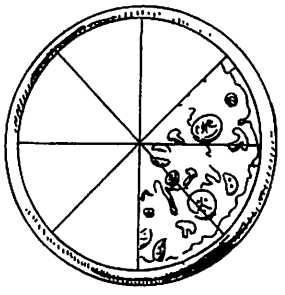
■ Decompose a fraction into a sum of fractions with the same denominator, and be able to justify them with equations.

For example, $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$, and $1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$.

■ Add and subtract mixed numbers (a whole number and a fraction combined into one "mixed" number) with like denominators by replacing each mixed number with an equivalent fraction.

For example, to solve $2\frac{1}{3} + 2\frac{1}{2} = x$; $2\frac{1}{3} = \frac{7}{3}$ or $\frac{14}{6}$ and $2\frac{1}{2} = \frac{5}{2}$ or $\frac{15}{6}$, so $\frac{14}{6} + \frac{15}{6} = \frac{29}{6}$, or $4\frac{5}{6}$

■ Solve word problems involving addition and subtraction of fractions referring to the same whole number and having like denominators by using visual fraction models and equations to represent the problem. For example, if there are 8 pieces of pizza, and Bill ate 3 and Sue ate 2, how many pieces are left and what fraction of the pizza was eaten?



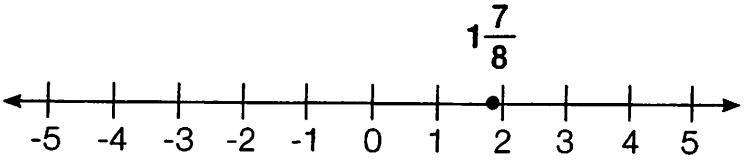
$1 - (\frac{2}{8} + \frac{3}{8})$

$\frac{8}{8} - (\frac{2}{8} + \frac{3}{8}) = \frac{8}{8} - \frac{5}{8} = \frac{3}{8}$

■ Understand a fraction $\frac{a}{b}$ as a multiple of $\frac{1}{b}$ and use this understanding to multiply a fraction by a whole number. For example, $3 \times \frac{2}{5}$ could be shown as $6 \times \frac{1}{5}$, with the product being $\frac{6}{5}$; $n \times \frac{a}{b} = \frac{n \times a}{b}$, with n being any number.

■ Solve word problems involving multiplication of a fraction by a whole number by using fraction models and equations. For example, if each person at a party will eat 3/8 pounds of roast beef and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?

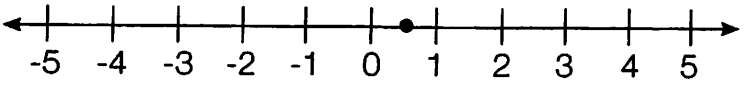
$5 \times \frac{3}{8} = \frac{15}{8} = 1\frac{7}{8}$



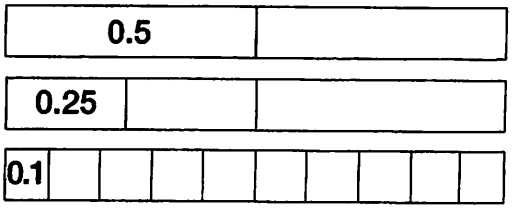
More Numbers and Operations – Fractions

■ Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express $\frac{3}{10}$ as $\frac{30}{100}$, and add $\frac{3}{10} + \frac{4}{100}$ ($\frac{3}{10} = \frac{30}{100}$) $+ \frac{4}{100} = \frac{34}{100}$

■ Use decimal notation for fractions with denominators 10 or 100. For example, rewrite $\frac{52}{10}$ as **.52**, and show **.52** on the number line.



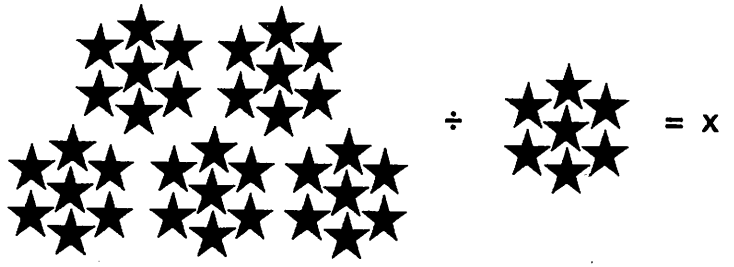
■ Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when two decimals refer to the same whole. Record the results of comparisons with pictures or with the symbols >, =, or <.
.5 > .25 .1 < .25



Operations and Algebraic Thinking

■ Use the four operations (+, -, x, ÷) with whole numbers to solve problems.

- Interpret a multiplication equation as a comparison; for example, interpret **35 = 5 x 7** as a statement that 35 is 5 times as many as 7 or 7 times as many as 5.
- Multiply or divide to solve word problems involving multiplication comparisons by using drawings and equations with a symbol for the unknown number to represent the problem.



35 ÷ 7 = 5

- Solve multi-step word problems posed with whole numbers and having whole number answers using the four operations (+, -, x, ÷) including problems in which remainders must be interpreted. **(37 ÷ 4 = 9 with a remainder of 1)** Use a letter to stand for the unknown quantity. **(37 ÷ 4 = a).**

■ Gain familiarity with factors and multiples.

- Find all factor pairs for a whole number in the range of 1 – 100.
  Example: 3 and 4 are factors of 12, because 3 x 4 =12. Also, 2 x 6 = 12 so 2 and 6 are also factors of 12, and 1 x 12 = 12 so 1 and 12 are factors of 12 as well. So ALL the factors of 12 are 1, 2, 3, 4, 6 and 12, as well as -1, -2, -3, -4, -6 and -12.

- Recognize that a whole number is a multiple of its factors **(for example, the factors of 12 are 1 x 12, 2 x 6, 3 x 4).**

- Determine whether a given whole number in the range 1 – 100 is a multiple of a given one-digit number. **Example: Is 25 a multiple of 5? Yes! Is it a multiple of 3? No!**

- Determine whether a given whole number in the range 1 – 100 is prime or composite. A prime number can be divided evenly (without having a remainder) only by 1, or itself. A prime number's only positive factors are 1 and itself.
  Example: 5 can only be divided evenly by 1 or 5, so it is a prime number. But 6 can be divided evenly by 1, 2, 3 and 6 so it is NOT a prime number (it is a composite number).

■ Generalize and analyze patterns.

- Generate several number patterns that follow a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. **For example, given the rule "add 3" and the starting number 1 (1, 4, 7, 10, 13, 16...) see that the resulting sequence appears to alternate between odd and even numbers. Can students tell why the numbers will continue to alternate in this way?**

Numbers and Operations in Base Ten

■ Generalize place value understanding for multi-digit whole numbers.

- Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. **700 = 70 x 10**

- Read and write multi-digit numbers using base-ten numerals **(73)**, number names, **(seventy-three)** and expanded form **(7 tens and 3 ones)**, and compare two multi-digit numbers using >, <, and = **(23 > 19)**.

- Use place value understanding to round whole numbers to any place.

100 Rounding Chart

0	1	2	3	4	5	6	7	8	9	10
10	11	12	13	14	15	16	17	18	19	20
20	21	22	23	24	25	26	27	28	29	30
30	31	32	33	34	35	36	37	38	39	40
40	41	42	43	44	45	46	47	48	49	50
50	51	52	53	54	55	56	57	58	59	60
60	61	62	63	64	65	66	67	68	69	70
70	71	72	73	74	75	76	77	78	79	80
80	81	82	83	84	85	86	87	88	89	90
90	91	92	93	94	95	96	97	98	99	100

■ Use place value understanding and properties of operations to perform multi-digit arithmetic.

- Fluently add and subtract multi-digit whole numbers. **(23 + 32 = 55; 55 – 23 = 32)**

- Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers.
  345 x 6 = (6 x 5 = **30**) + (6 x 40 = **240**) + (6 x 300 = **1800**) = **2070**

- Find whole number quotients and remainders with up to four-digit dividends and one-digit divisors using strategies based on place value, properties of operations, and the relationship between multiplication and division.

  Quotient = the answer after you divide one number by another
  dividend ÷ divisor = quotient or 375 ÷ 25 = 15

  Remainder = the amount left over after division.

  Example: 19 cannot be divided evenly by 5. The closest you can get without going over is 3 x 5 = 15, which is 4 less than 19. So the answer of 19 ÷ 5 is 3 with a remainder of 4.

  $19 \div 5 = 3\text{R}4 = 3\frac{4}{5}$

  ↑ remainder

Measurement and Data

■ Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

- Know relative sizes of units within one system of units, including kilometers, meters, kilograms, grams, pounds, ounces, liters, minutes, hours, and seconds. Be able to express a large unit in terms of a smaller unit.
  A 2 ft snake is 24 in, a 3 ft snake is 36 in, and a 4 ft snake is 48 in.
  An hour has 60 seconds, and a day has 24 hours.

- Use the four operations (**+, -, x, ÷**) to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals.

- Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area (120 sq ft) and length (12 ft) of the flooring, by viewing the area formula as a multiplication equation with an unknown factor. **(Area = l x w; area ÷ l = w, so 120 ÷ 12 = 10)**

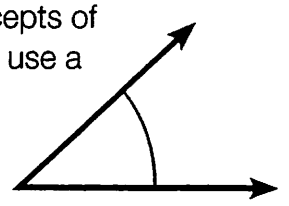
■ Represent and interpret data.

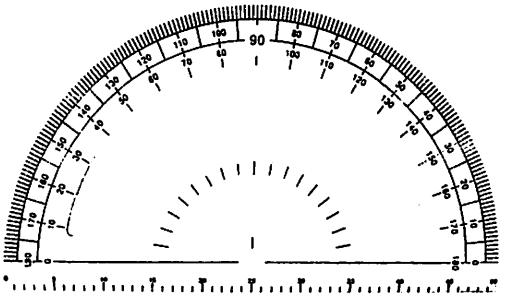
- Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$).

Line Plot				
4		x		x
3		x	x	x
2	x	x	x	x
1	x	x	x	x
	$\frac{1}{4}$ inch	$\frac{1}{2}$ inch	$\frac{3}{4}$ inch	1 inch

■ Geometric Measurement

Recognize angles as geometric shapes that are formed whenever two rays share a common endpoint, and understand concepts of angle measurement. Be able to use a protractor to measure angles.

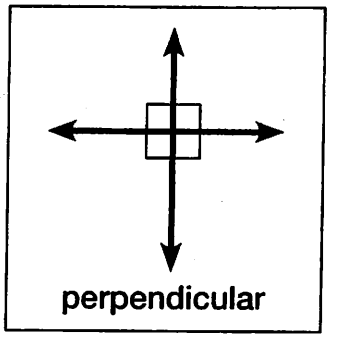


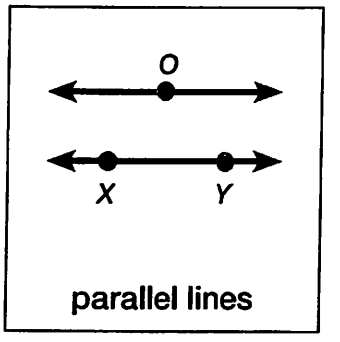


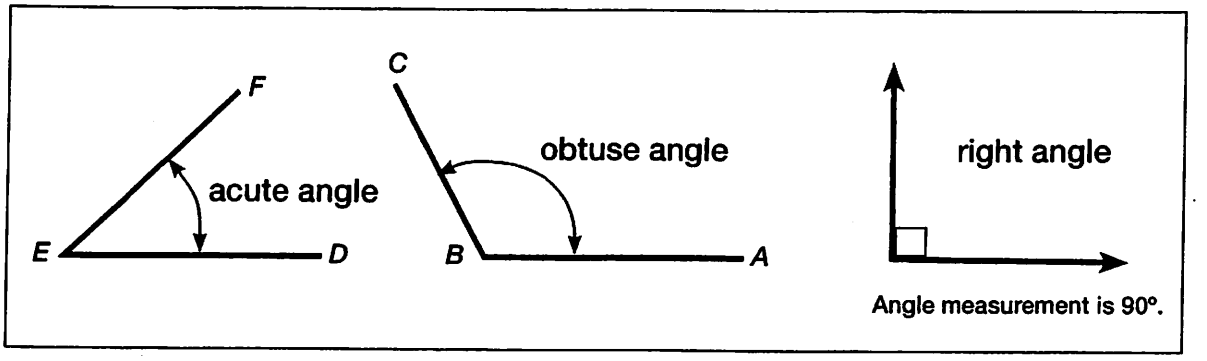
Geometry and Spatial Sense

■ Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

- Draw points, lines, line segments, rays, angles (right angle is a 90° angle, acute angle is less than 90°, and an obtuse angle is one that is more than 90°) and perpendicular and parallel lines.







Fourth Grade Student Self-Check List

Students: You have been working on learning these skills this year. The green shaded boxes are the areas teachers gave extra focus to this year. Are you able to do these things? Check the box next to the skill if you can do it.

- ☐ Use addition, subtraction, multiplication, and division with whole numbers to solve word problems.
- Learn about factors and multiples, i.e.,
  - ☐ • Positive factors of 24 are: 1, 2, 3, 4, 6, 8, 12
  - ☐ • Some multiples of 4 are: 4, 8, 12, 16, 20...
- ☐ Make and describe patterns with objects and numbers.
- Understand and use place value to generalize to 1,000,000.
  - ☐ • Expanded form: 6783 = 6000 + 700 + 80 + 3
- ☐ Compute with multi-digit numbers.
- ☐ Solve problems involving using multiplication of multi-digit by two-digit numbers.
- ☐ Divide multi-digit numbers by one-digit divisor.
- ☐ Round multi-digit numbers to any place.
- ☐ Build understanding of equivalent fractions and ordering fractions.
- ☐ Compare two fractions with different numerators and different denominators by making common denominators.
- ☐ Add and subtract fractions and mixed numbers with like denominators.
- ☐ Understand the decimal notation for fractions.
- ☐ Compare decimals.
- ☐ Solve problems using measurement conversions.
- ☐ Apply area and perimeter formulas for rectangles.
- ☐ Organize and explain data using a line plot.
- ☐ Understand and measure angles.
- ☐ Draw and identify lines and angles.
- ☐ Describe and sort shapes by their lines and angles.