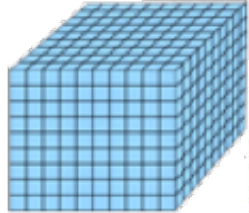
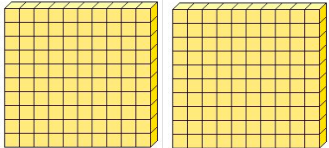
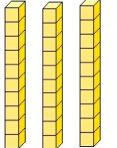

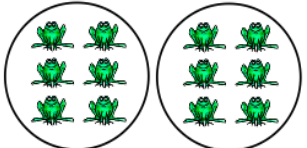

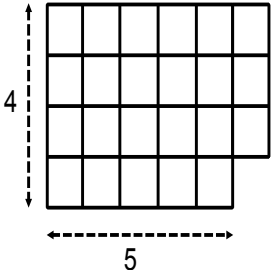


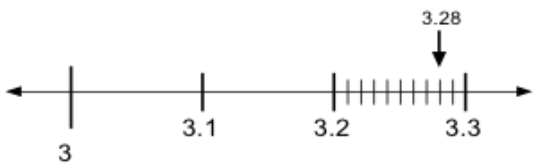
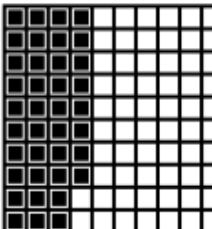
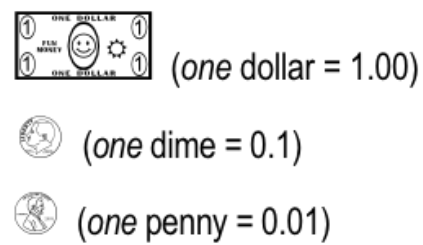
Grade 4 ~ Benchmark 1 ~ Instructional Support

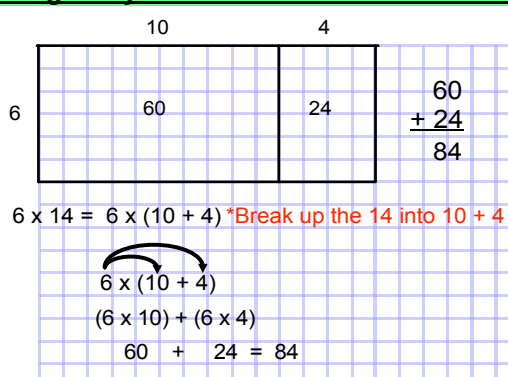
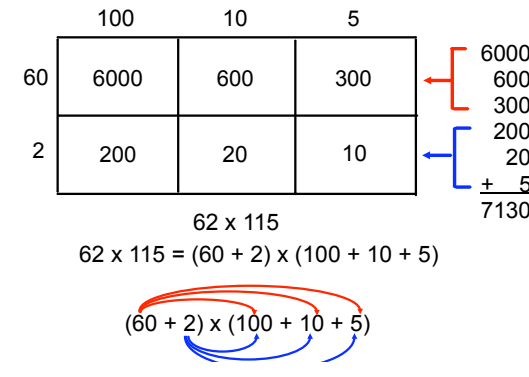
Block 1	Block 2	Block 3										
Graphing, Grids, and Facts Fourth graders start the year off by collecting, organizing, displaying, and analyzing data. This real-world application lays a strong foundation for thinking about the meaning of numbers. They also continue the working with one-digit multiplication and division facts from 3rd Grade. This continues through blocks 2 and 3.	Number Relationships The work of understanding whole numbers, which began in Kindergarten, extends to larger numbers (up to one million) in block 2. Students examine relationships between numbers and represent them using equality/inequality symbols. They are introduced to a new form of representing number: squaring ($2^2 = 2 \times 2$).	Basic Multiplication/Division & Algebra A serious study of multiplication begins in block 3. Understanding multiplication facts builds a foundation for modeling one-digit by two-digit multiplication. Students rely heavily on the commutative, associative, and identity properties of addition and multiplication, and the zero property of multiplication to support their work in multiplication.										
Models for Multiplication can be found on the 3rd Grade Benchmark 2 Instructional Support page.	Models for Division can be found on the 3rd Grade Benchmark 3 Instructional Support page.	Properties for Operations can be found on the 3rd Grade Benchmark 1 & 2 Instructional Support pages.										
<p>Concepts of Number: Fourth Grade students are still solidifying concepts of number, which makes it important to provide meaning and strategies for making sense of larger numbers. A direct correlation should be made between the base-ten image, expanded form, and standard form of a number. (A small number is used in this example to save space.)</p> <div style="display: flex; align-items: center; justify-content: space-around;"> <div style="text-align: center;">  <p>1 group of 1,000 = 1,000</p> </div> <div style="text-align: center;">  <p>2 groups of 100 = 200</p> </div> <div style="text-align: center;">  <p>3 groups of 10 = 30</p> </div> <div style="text-align: center;">  <p>5 groups of 1 = 5</p> </div> </div> <div style="margin-left: 20px;"> \rightarrow <table style="border-collapse: collapse;"> <tr><td>1 groups of 1,000 =</td><td style="text-align: right;">1,000</td></tr> <tr><td>2 groups of 100 =</td><td style="text-align: right;">200</td></tr> <tr><td>3 groups of 10 =</td><td style="text-align: right;">30</td></tr> <tr><td>5 groups of 1 =</td><td style="text-align: right;">+ 5</td></tr> <tr><td></td><td style="text-align: right; border-top: 1px solid black;">1,235</td></tr> </table> </div> <div style="margin-left: 20px;"> \rightarrow One purpose of expanded form is to visibly retain the value of the digits, which are often hidden in standard form. </div>			1 groups of 1,000 =	1,000	2 groups of 100 =	200	3 groups of 10 =	30	5 groups of 1 =	+ 5		1,235
1 groups of 1,000 =	1,000											
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5 groups of 1 =	+ 5											
	1,235											
<p>Relationship between Multiplication and Division: Multiplication can be thought of as repeated addition of the same size sets to create a total. (One factor tells the number of groups and the other tells the number in each group.) Division can be thought of as beginning with a total and breaking it into equal sized groups. Students should recognize multiplication as counting by multiples and division as breaking a number apart by factors. Both perspectives can be seen in the frog image below. This holds true even when dividing numbers with remainders (Quotient-Remainder Theorem). For more information, see the 3rd Grade Benchmark 3 Instructional Support Document.</p>												
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>$2 \times 6 = 12$ $12 \div 2 = 6$</p> </div> <div style="text-align: center;">  <p>$6 \times 2 = 12$ $12 \div 6 = 2$</p> </div> </div>		<p>The Quotient-Remainder Theorem says that a division problem can be represented as a multiplication sentence, even with remainders.</p> <p>$23 = (4 \times 5) + 3$, or $23 \div 4 = 5 \text{ r } 3$</p>										
<p>Dividing by Zero is Not Possible: Dividing by zero is not a “math rule” to be memorized. It means that there is no answer that makes sense. There are two ways to test this out.</p> <p><u>Method 1:</u> If you think of $10 \div 0$ being equal to some number, it would be the missing factor in $\underline{\quad} \times 0 = 10$ (“how many groups of size 0 make 10?”). There is no such number.</p> <p><u>Method 2:</u> If you think of solving $0 \div 0 = \underline{\quad}$, which is the same as solving $0 = 0 \times \underline{\quad}$. Any number fits in this blank. So the division expression $0 \div 0$ does not represent one particular number, as all other division expressions do.</p> <p>In the first case division by zero does not specify any number, while in the second case it specifies every number.</p>												

Grade 4 ~ Benchmark 2 ~ Instructional Support

Block 4	Block 5	Block 6
<p>More Multiplication and Division & Patterns The complexity is increased with multiplication and division for students as they apply their understanding of these two operations to more complex numbers situations (multiply two-digits by two-digits and divide a three-digit dividend by a one-digit divisor). The use of story problems and modeling provides an avenue for making sense of this complexity. Students also analyze growing patterns through graphs, tables, and rules. The approximate teaching time for Block 4 is two weeks providing more time for teaching Blocks 5 & 6.</p>	<p>Expressing Parts of a Whole Students begin the work of representing, ordering, and comparing parts of a whole in decimal form to hundredths. This is directly correlated to their work with fractions by comparing models, pictures, and symbols. Students are not operating with fractions or decimals in this block. They are making connections between the two forms of representing parts of a whole.</p>	<p>Even More Multiplication and Division & The Distributive Property Students build on their knowledge of multiplication and division and multiply up to a three-digit factor by a two-digit factor and continue to divide up to a three-digit dividend by a one-digit divisor. The distributive property is formally introduced as a tool for solving multi-digit multiplication problems.</p>

Decimal Models

<p>Measurement Model (number line, metric units) (Decimals specify points on a number line by repeatedly subdividing intervals into tenths – ‘deci’ means tenth. The unlimited number of subdivisions is called the Density Property.)</p>  <p style="text-align: center; font-size: 24pt;">3.28</p>	<p>Area Model (hundreds square)</p>  <p style="text-align: center; font-size: 24pt;">0.38</p>	<p>Set Model (pennies, dimes, dollar)</p>  <p style="text-align: center; font-size: 24pt;">\$1.11</p>
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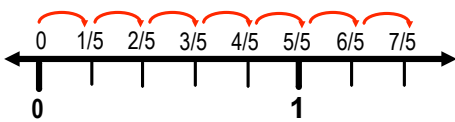
<p style="background-color: #00ff00; color: black; padding: 2px;">Using Arrays to Teach the Distributive Property</p>  <p style="text-align: center; font-size: 24pt;">84</p>	<p>Arrays can be created for 3-digit by 2-digit multiplication problems using base-ten blocks (or on graph paper). Students should understand that</p> <ul style="list-style-type: none"> ~the blocks maintain the value of the number in expanded form, and ~after the number is expanded, all parts of one factor should be multiplied by all parts of the other factor. 	 <p style="text-align: center; font-size: 24pt;">7130</p> <p style="font-size: 12pt;">Open arrays need not be proportional once the concept is understood, and they can be created to multiply numbers of any size.</p>
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Grade 4 ~ Benchmark 2 ~ Instructional Support *Continued*

Block 4	Block 5	Block 6
<p>More Multiplication and Division & Patterns The complexity is increased with multiplication and division for students as they apply their understanding of these two operations to more complex numbers situations (multiply two-digits by two-digits and divide a three-digit dividend by a one-digit divisor). The use of story problems and modeling provides an avenue for making sense of this complexity. Students also analyze growing patterns through graphs, tables, and rules. The approximate teaching time for Block 4 is two weeks providing more time for teaching Blocks 5 and 6.</p>	<p>Expressing Parts of a Whole Students begin the work of representing, ordering, and comparing parts of a whole in decimal form to hundredths. This is directly correlated to their work with fractions by comparing models, pictures, and symbols. Students are not operating with fractions or decimals in this block. They are making connections between the two forms of representing parts of a whole.</p>	<p>Even More Multiplication and Division & The Distributive Property Students build on their knowledge of multiplication and division and multiply up to a three-digit factor by a two-digit factor and continue to divide up to a three-digit dividend by a one-digit divisor. The distributive property is formally introduced as a tool for solving multi-digit multiplication problems.</p>

Key Ideas About Fractions

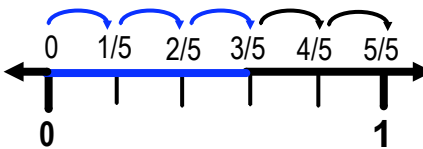
- A fraction can be viewed as a point on a number line, just like whole numbers.




- Fractional pieces can be counted, or iterated, as in 1/5, 2/5, 3/5 (one fourth, two fourths, three fourths), etc.
- A fraction is a single number, not two numbers.
- A fraction contains two parts:

Numerator	Tells the number of fractional units
Denominator	Names the fractional unit by saying how many fractional units it takes to make a whole
- Fractional pieces must be the same size if they are the same unit.


Fraction Models



Measurement (Length)
3 out of 5 hops are blue, 3/5

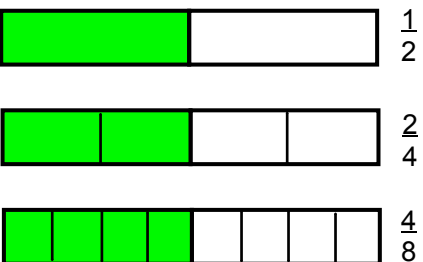
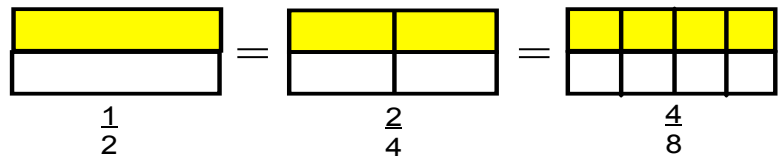


Area (region)
3 out of 5 sections are blue, 3/5



Set
3 out of 5 stars are blue, 3/5

Equivalent Fractions

<p>Fraction Strips (a concrete approach): Fold paper strip in half and color one side, then continue with folds as shown.</p> 	<p>Subdivided Areas (a pictorial approach)</p>  <p style="text-align: center;"> $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$ </p> <p>Students who understand subdivided areas are ready to rename fractions using standard notation. ⇒</p>	<p>Numbers</p> $\frac{1}{2} = \frac{\square}{4}$ $\frac{2}{4} = \frac{4}{\square}$
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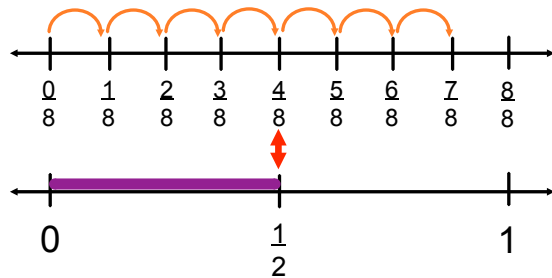
Grade 4 ~ Benchmark 3 ~ Instructional Support

Block 7	Block 8	Block 9
Operating with Fractions and Decimals Problem solving and fraction work were purposefully joined together in this block to provide opportunity for students to make sense of adding and subtracting fraction. Models and story context will be useful tools in this process. Students will also add and subtract decimals to the tenths and thousandths.	Geometry and Measurement The work of this block focuses on 2-D shapes. Students describe the types of angles and lines within a shape, apply transformations, and learn that angles are measured in degrees. They recognize other measureable attributes of 2-D shape by examining area and perimeter.	Measurement and Probability The majority of the measurement work in this block is capacity with customary and metric units. (Some time is spent working with length and weight in metric units.) Work with area from block 8 is extended to include triangles and parallelograms in block 9. Finally, students conduct simple probability experiments and begin learning about likelihood of events in an experiment.

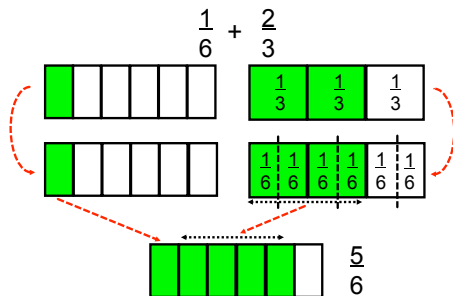
Models for Adding and Subtracting Fractions

Once we agree on the fractional unit, we count, add, and subtract just like whole numbers using verbal statements such as "1 third + 1 third = 2 thirds". Once this is understood, students can move to the notation: $1/3 + 1/3 = 2/3$. The difficult part for students is not understanding the addition, but learning to recognize that the denominator is only naming the fractional unit. ****All images below also work for subtracting fractions.****

Fraction Bar (Measurement) Models

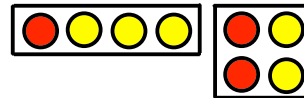


After two equal sized number lines are lined up and compared, students can see that $1/2$ is equal to $4/8$ and can count (iterate) by eighths.



Familiarity with unit fractions ($1/3$, $1/4$, etc.) and how many it takes to make a whole will help students know when to subdivide a unit to find a common denominator.

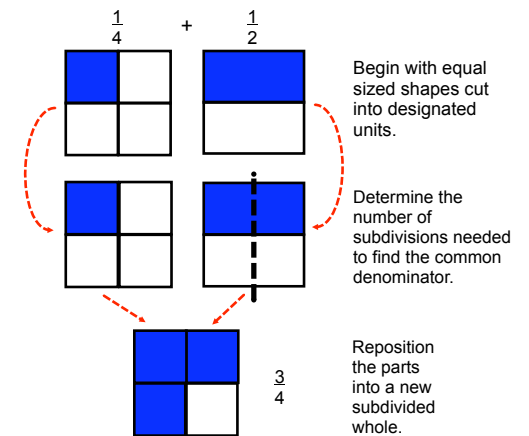
Set Model



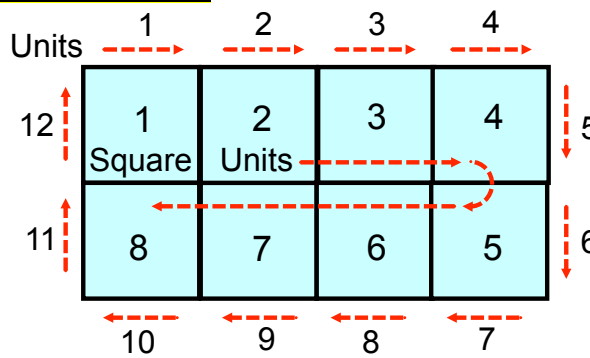
$$\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$$

Students should think about how many sets they can add to $1/2$ until they have the same amount in both boxes (finding the common denominator). Sometimes sets will be added to both boxes until a common quantity exists.

Area (Region) Model



Area and Perimeter



Perimeter is a 1-dimensional measurement to determine the distance around a 2-dimensional shape.

Area is a 2-dimensional measurement to determine the space enclosed in a figure and is written in square units.

All measurements should be completed without gaps or overlaps for accuracy.

This is a challenging topic for many 4th graders and memorizing formulas is not enough to build understanding. Children should have opportunity to develop these ideas through hands-on activities.