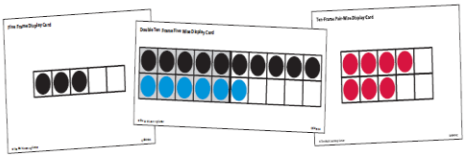
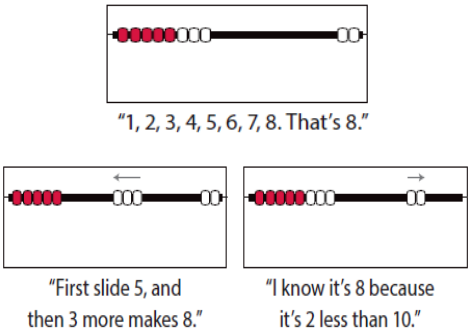
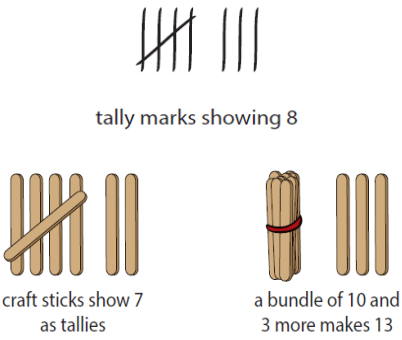
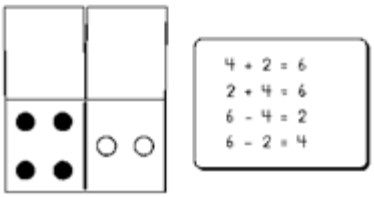
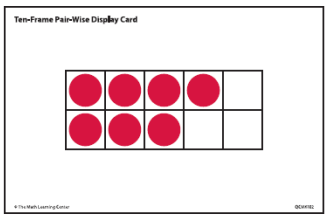
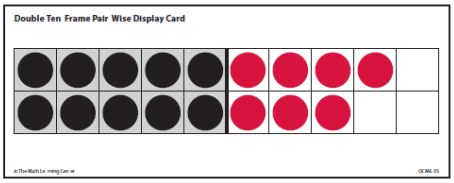
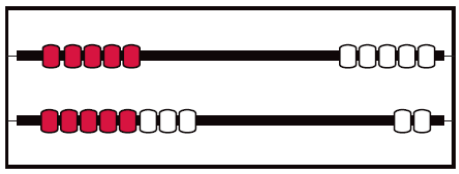
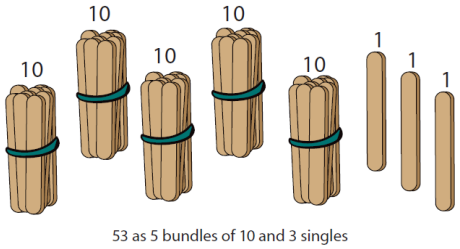
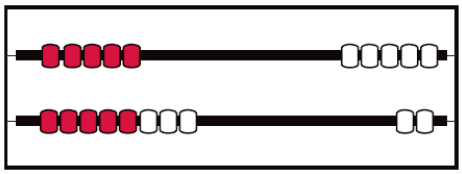
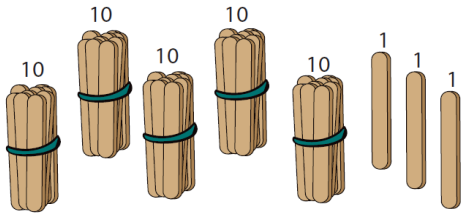
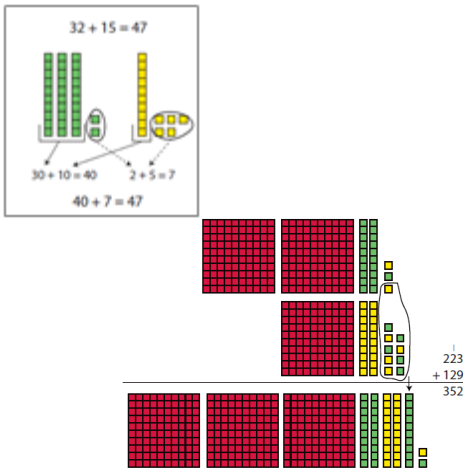
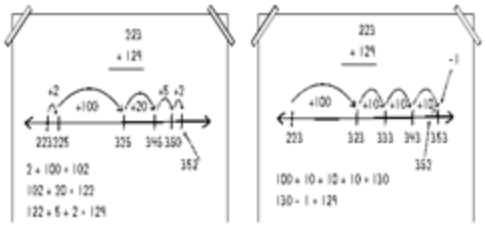
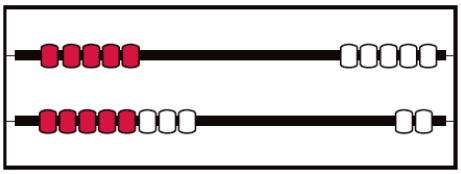
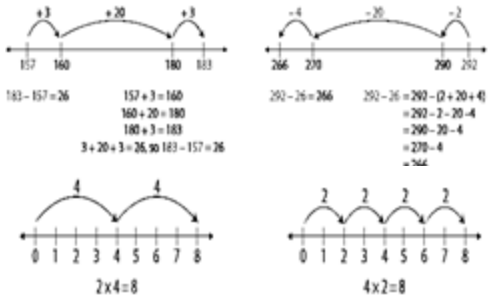
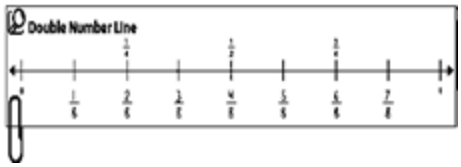
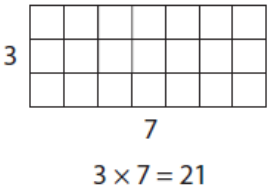
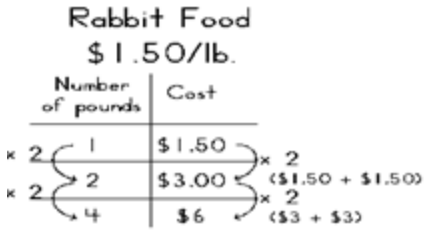
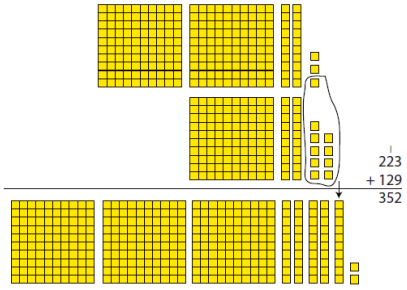
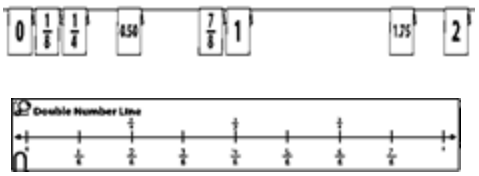
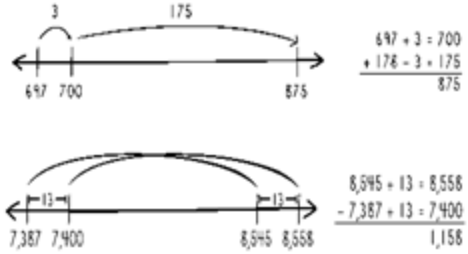
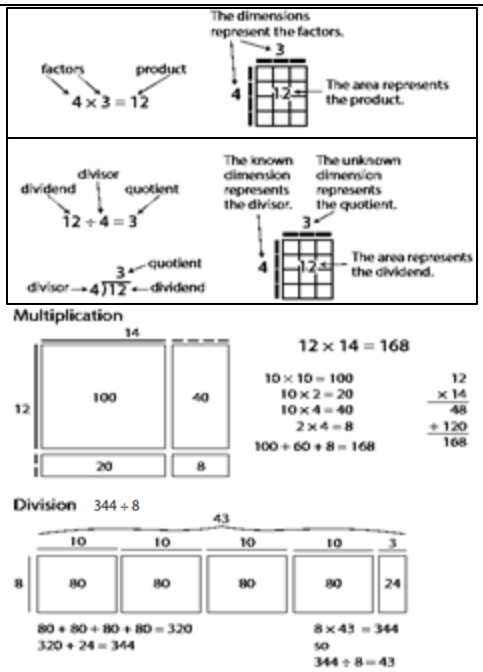
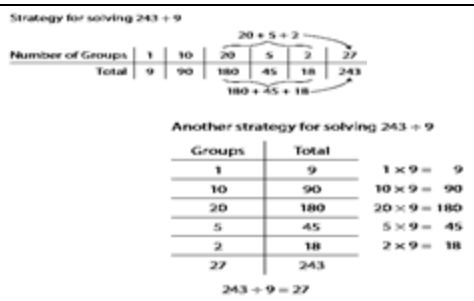
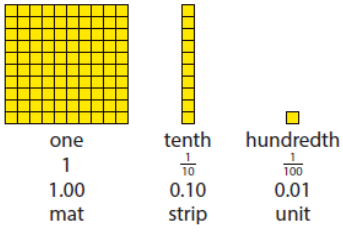
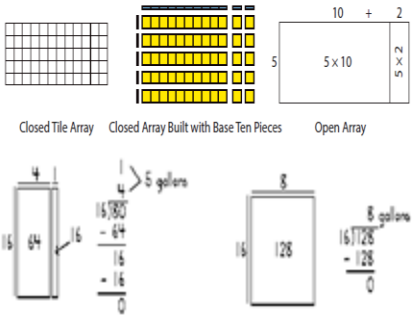
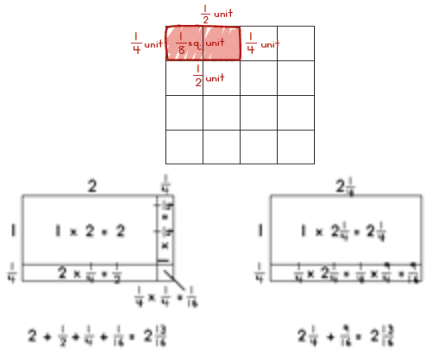
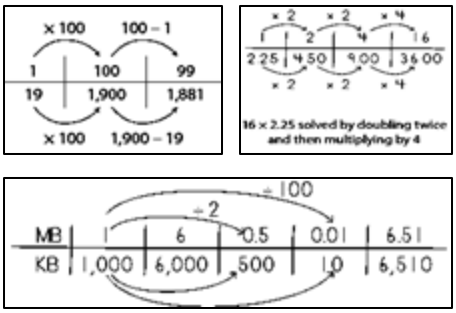
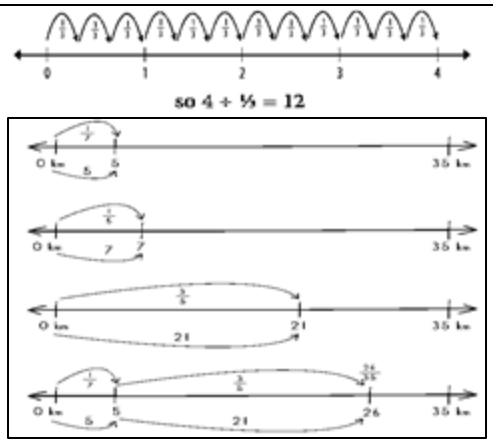
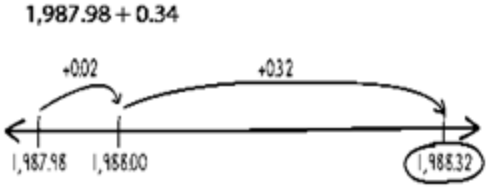
GRADE	MODELS	PICTURE	HOW AND WHY THE MODEL IS USED
Kindergarten The models used in Kindergarten are used to help students understand numbers, make sense of relationships among numbers and begin to develop strategies for addition and subtraction.	Five/Ten/ Double Ten Frames		Kindergarteners see the numbers 0-20 represented on 5, 10 and double 10 frames. They also use counting mats (empty frames) to represent these numbers and compute with them. Over time these models help students instantly recognize quantities without having to count them.
	Number Rack		Students use the number rack to count and compute with numbers from 0-10. With 5 white beads and 5 red beads, the number rack helps the students think about groups of 5 and ten. Beads start at the right hand side and are slid to the left when in use.
	Tallies and Bundles and Sticks		As they begin to explore the ways in which numbers can be built and broken down (composed and decomposed) into groups, students used tallies and bundles and sticks to represent the groups of 5 and 10 in numbers greater than 5. Both support place value understanding by clearly representing the groups of 5 and 10, while also making it possible for students to count the individual lines and sticks in the group as needed.
	Number Line		The number line helps kindergarteners connect counting numbers both forward and backward with written numbers. It also helps students see the relationships between numbers. For example, 1 is the same distance from 2 as 5 is from 6; 5 is halfway between 0 and 10; and 6 is between 5 and 7.

GRADE	MODELS	PICTURE	HOW AND WHY THE MODEL IS USED
First Grade The models in 1st grade are used to help students compose and decompose numbers, make sense of relationships among numbers, understand place value, develop strategies for basic addition and subtraction, and begin to add and subtract with multi-digit numbers.	Dominoes		These are used to help students instantly recognize quantities and to model addition and subtraction.
	Ten Frames		Ten-frames help students with quantities up to 10 without counting and help students see numbers in terms of their relationship to landmark numbers of 5 and 10, building a solid foundation for addition and subtraction facts to 10. They encourage seeing doubles, counting by 2's, and identifying odd and even numbers.
	Double Ten Frames		Double ten-frames help students understand the teen numbers and 1 ten and some more ones since cards show one filled ten-frame and a second frame of more dots or cubes. Its helps develop place value as the students see the connection of 10 ones as 1 ten.
	Number Rack		Students use the number rack to create and actively manipulate numbers between 0 and 20. It is used to model a given number and then as a way to model and solve problems. It helps students see that one number can be a combination or sum of 2 or more other numbers. For example, students might see 13 as one group of 10 and 3 more. The model is made of 2 strings of 10 beads; each string broken into a group of 5 red and 5 white beads. Because of the different groupings, students can think in groups of 2, 5 and 10. Beads start at the right hand side and are slid to the left when in use.
	Bundles and Sticks	 53 as 5 bundles of 10 and 3 singles	This model supports the understanding of place value by clearly separating groups of 10, while also making it possible for students to count the sticks in each group as needed. Later, students use them to develop models and strategies for double-digit addition and subtraction based on regrouping.
	Number Line and Open Number Line	 Jumping Strategy	At first, the number line is used to represent numbers in order. Later, it is used to develop and model strategies for adding and subtracting. The open number line allows students to break up the line as they see fit; since they no longer need to count by 1's, first graders' number lines show strategies that involve a flexible approach to working with tens and ones.

GRADE	MODELS	PICTURE	HOW AND WHY THE MODEL IS USED
Second Grade The models in 2nd grade are used to help students structure number, continue to develop and apply place value understandings, and develop efficient strategies for computing with multi-digit numbers.	Number Rack		Students will continue to use the number rack to create and actively manipulate numbers between 0 and 20 like they did in 1st grade. In 2nd grade, the number rack also helps students use strategies that promote fact fluency, while also developing a deep understanding of the properties of the basic operations. The model is made of 2 strings of 10 beads; each string broken into a group of 5 red and 5 white beads. Because of the different groupings, students can think in groups of 2, 5 and 10. Beads start at the right hand side and are slid to the left when in use.
	Bundles and Sticks	 53 as 5 bundles of 10 and 3 singles	This model is extended in 2nd grade to support the understanding of place value by clearly representing groups of 10 and 100, while also making it possible for students to compose and decompose those groups. Students use these to model multi-digit addition and subtraction.
	Base Ten Area Pieces		Students use base ten area pieces that are pre-grouped into 1, 10 and 100, to represent and compute with multi-digit numbers. Because the pieces are pre-grouped, the students cannot take them apart and assemble them like they did with Bundles and Sticks, instead they will need to trade a tens piece for 10 ones or a hundreds pieces for 10 tens. This grouping, ungrouping and trading pieces is critical for developing place value understanding. Using base ten pieces to add and subtract multi-digit numbers helps students to develop strategies that rely upon regrouping, including the traditional method.
	Number Line and Open Number Line	 In this example, the student began at 223 and added 129 in smaller pieces to get to the sum, 352. In this example, the student added 100 and 3 tens to 223. Then they subtracted 1 to compentsate, for a total of 352.	Students use the number line to develop and model strategies for adding and subtracting multi-digit numbers, many of which do not involve regrouping. The open number line allows students to partition the number line as they see fit and to use landmark numbers that are comfortable for them. The open number line provides a way for students to develop strategies, keep track of the steps involved and communicate about their thinking with others.

GRADE	MODELS	PICTURE	HOW AND WHY THE MODEL IS USED
Third Grade The models in 3rd grade are used to help students develop strategies for computing with multi-digit numbers, with a focus on multiplication and division.	Number Rack		The number rack continues to be used in 3rd grade to promote fact fluency for addition and subtraction. It is also used to show the idea that a collection of items can be thought of as one unit (i.e. 12 inches is the same as 1ft or 1000ml is the same as 1L). This model also can be used to show repeated addition as well as subtraction by removal or comparison.
	Number Line and Open Number Line		In 3rd grade students learn to drawn their own number lines, which they can use to add and subtract with large numbers. Number lines allow students to move from repeated addition to the basics of multiplication, and even provides a context for fractions. Number lines provide a way for students to develop strategies, keep track of the steps involved and communicate about their thinking with others.
	Double Number Line		In 3rd grade students build an understanding of fractions and equivalencies. A special number line marked from 0 to 1 offers them a way to see fractional increments and explore relationships among different fractions. Egg cartons, rulers, clocks, patterns blocks and folded rectangles are also models used in 3rd grade to aid in the understanding of fractions as parts of a whole or parts of a set.
	Arrays		This model is used to help students connect the idea of multiplication to the area of a rectangle. The numbers being multiplied correspond to the dimensions of the rectangle, and the product is the area of the rectangle. It allows students to see that the products of numbers are much larger than the sum of the same two numbers, which can be confusing for some children.
	Ratio Tables		The ratio table is used for the first time in 3rd grade to build an understanding about multiplication and the relationships between numbers. Students use ratio tables to model situations with a pattern, keeping track of related multiplication combinations and using combinations they have already solved or that they already know to find unknown products.
	Base Ten Area Pieces		Base ten areas pieces are important in introducing the standard way to add and subtract. These pieces focus on each place and value. So, it is easy for students to see and understand that when you add the ones you'll need to regroup (trade 10 ones for a ten or carry a ten to the tens place) if, after adding, you end up with more than 9 ones.

GRADE	MODELS	PICTURE	HOW AND WHY THE MODEL IS USED
Fourth Grade The models in 4th grade are used to help students develop efficient strategies for computing with multi-digit numbers, as well as analyzing fractions, and decimals.	Number Line and Double Number Line		Students in 4th grade will use the number line to compare and order fractions and decimals. By reasoning about the relationships between the numbers, students place fractions and decimals on a number line given the position of other numbers already placed. In addition, students will use paper strips, egg cartons, geoboards and base ten pieces to model, read, write, compare, compose and decompose fractions.
	Open Number Line		The open number line is used to show how repeated addition is related to multiplication. It is also used to model addition and subtraction strategies such as give and take or constant difference. • Give and take is moving one part of a number to the other numbers to make addition easier. • Constant difference is adding or subtracting the same value to both numbers to make the subtraction easier
	Array or Area Model		Students build on this model from 3rd grade by continuing to work with multiplication and beginning division. They expand the model by using closed arrays, base 10 and linear pieces, and then open arrays. • Closed array-they count each square units by 1. • Base 10 and Linear array- the area is modeled in bigger chunks, tens and ones, and the dimensions are defined by the linear pieces helping students distinguish between area measures and linear measures. • Open array- arrays are chunked together in pieces that are convenient and efficient for the problem. While students will discover many ways to solve multiplication and division problems, the array model provides a way for them to discuss their strategies with one another, decompose (break apart) the numbers, apply the distributive property, and identify partial products.
	Ratio Table		Ratio Tables in 4th grade continue to build an understanding about multiplication and the relationships between numbers. Later, the ratio table becomes a tool for students to use when problem solving, computing multiplication, division, and fraction problems, as well as make conversions. This model will continue to be used in higher grades as well.
	Base Ten Area Pieces		Base ten area pieces are important in introducing the standard way to add and subtract because they focus on place and value. Because this model was in 3rd grade, students in 4th grade are expected to transition very quickly from base 10 pieces to numbers. In addition, base 10 pieces can be used to model fractions when the large square is assigned a value of one.

GRADE	MODELS	PICTURE	HOW AND WHY THE MODEL IS USED
Fifth Grade The models in 5th grade are used to help students develop efficient strategies for computing with multi-digit numbers, fractions and decimals.	Array or Area Model- Whole Numbers		Students continue their work with this model from 3rd & 4th grade to develop efficient methods for building, sketching, and recording multi-digit multiplication and division problems. It also provides a foundation that allows students to use the traditional method with understanding.
	Array or Area Model- Fractions		When students begin to multiply fractions, the area model helps them with understanding why the product of two fractions is often smaller than the two fractions being multiplied. The area model is also a powerful tool when multiplying mixed numbers. It connects multiplying mixed numbers to students' work with multiplying whole numbers. Splitting the mixed number into whole numbers and fractions makes it a manageable multiplication problem. As students become more efficient they may split the array into two parts instead of four.
	Ratio Table		This model is used to continue and expand upon the work done in 3rd and 4th grade. Early in the year the model is used to represent such multiplication strategies as increasing one of the factors by 1 to simplify an otherwise difficult problem. Ratio tables can also be used to model finding common denominators to add and subtract fractions, multiply and divide decimals, and develop an understanding of where to place the decimal point when multiplying or dividing by powers of 10.
	Number Line and Double Number Line		Number lines and double number lines are used as a tool to develop an understanding of computing operations with fractions. Students can use these models to answer questions like the ones below (models shown to the left) 1. 4 ÷ 1/3 = 12 2. Mr Miles has a 35 km trail by his house. He ran 1/7 of the trail 1 day and then 3/5 of the trail the next day. What fraction of the trail did he run in all? How many total km did he run?
	Open Number Line		Students use the open number line in in 5th grade as a tool to solve decimal addition and subtraction problems. The open number line allows student to be flexible and zoom in or out on whatever section of a number line they need for a given problem. This model allows students to focus on the decimal relationships without having to worry so much about the thousands, hundreds and tens.