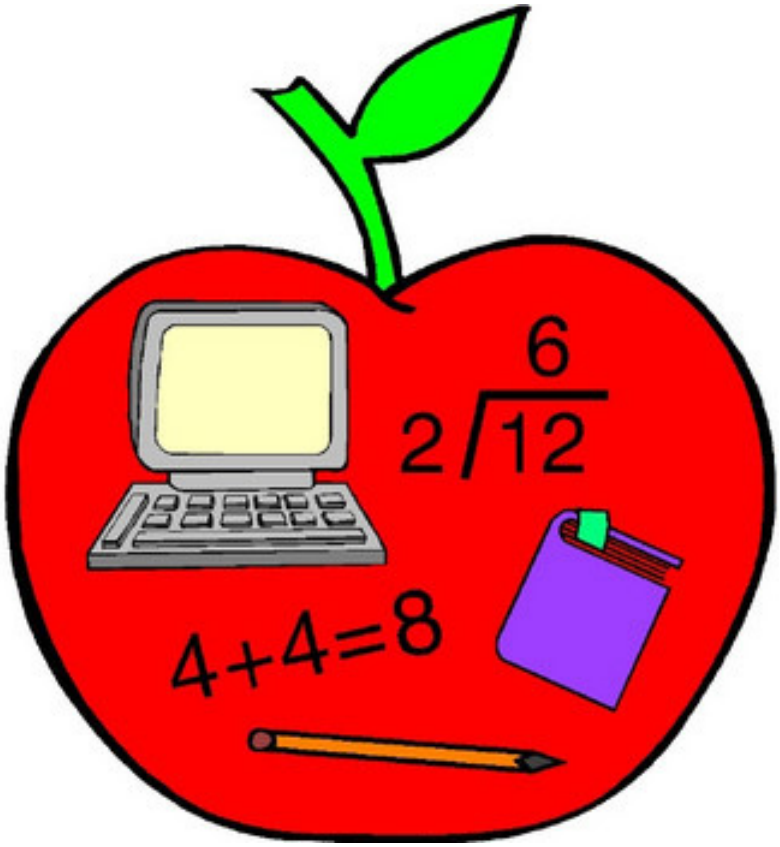
Roselawn Elementary School

A Family Resource Guide to 4th Grade Mathematics



Dear Roselawn School Family,

The Family Math Resource Guide has been as a resource to assist you in becoming familiar with Roselawn's Mathematics Standards for 4th Grade.

This resource guide includes:

1. An overview of Mathematical Practices for 4th Grade
2. Parent's Backpack Guide to Common Core Standards
3. How 4th Grade fits in the Mathematical Progression
4. Partnering with your child's teacher
5. 4th Grade Math Glossary
6. 4th Grade Math Strategies
7. Addition stages and strategies
8. Subtraction stages and strategies
9. Resources for 4th Graders and their families.

If you have any questions regarding anything within this resource guide, please contact our classroom teacher.

An Overview of 4th Grade Math

In Grade 4, instructional time will focus on three critical areas: (1) developing understanding and fluency with multidigit multiplication, and developing understanding of dividing to find quotients involving multidigit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

Mathematical Practices

These eight practices are the goals of all math education, K-12

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

1. Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

2. Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., $15/9 = 5/3$), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

3. Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Big Ideas in Grade 4

Operations and Algebraic Thinking

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten

- Generalize place value understanding for multi-digit whole numbers.
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- Extend understanding of fraction equivalence and ordering.
- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- Understand decimal notation for fractions, and compare decimal fractions.

Measurement and Data

- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data.
- Geometric measurement: understand concepts of angle and measure angles.

Geometry

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

Parent's Backpack Guide to Mathematics Standards

The chart below shows what is shifting, what you might see in your child's backpack and what you can do to help your child. Again, if your child's assignments do not reflect the shifts, then talk to our child's teacher.

What's Shifting?	What to Look for in the Backpack?	What Can You Do?
• Your child **will work more deeply in fewer topics**, which will ensure full understanding (less is more!).	• Look for assignments that require students to show their work and explain how they arrived at an answer.	• Know what concepts are important for your child based on their grade level and spend time working on these concepts.
• Your child will **keep building on learning year after year**, starting with a strong foundation.	• Look for assignments that build on one another. For example, students will focus on adding, subtracting, multiplying and dividing. Once these areas are mastered, they will focus on fractions. Building on that, they will then focus on Algebra. You should be able to see the progression in the topics they learn.	• Be aware of what concepts your child struggled with last year and support your child in those challenge areas moving forward.
• Your child will **spend time practicing and memorizing math facts.**	• Look for assignments that ask your child to master math facts such as addition groupings up to 20 or multiplication tables.	• Help your child know and memorize basic math facts. Ask your child to "do the math" that pops up in daily life.
• Your child will **understand why the math works and be asked to talk about and prove their understanding.**	• Your child might have assignments that ask her or him to show or explain their mathematical thinking — to SAY why they think their answer is the right one.	• Talk to your child about their math homework and ask them to teach you new concepts. Help them figure out ways to explain their thinking.
• Your child will not be asked to **use math in real-world situations**.	• Look for math assignments that are based on the real world. For instance, homework for 5th graders might include adding fractions as part of a dessert recipe or determining how much pizza friends ate based on fractions.	• Provide time every day for your child to work on math at home.

How 4th Grade "Fits" in the Progression

In grade four, your child will use addition, subtraction, multiplication, and division to solve word problems, including problems involving measurement of volume, mass, and time. Students will continue to build their understanding of fractions—creating equal fractions, comparing the size of fractions, adding and subtracting fractions, and multiplying fractions by whole numbers. They will also start to understand the relationship between fractions and decimals.

Grade Three Mathematics	Grade Four Mathematics	Grade Five Mathematics
• Use place value understanding to round whole numbers to the nearest 10 or 100 • Quickly and accurately add and subtract numbers through 1000 using knowledge of place value • Use place value understanding to multiply and divide numbers up through 100 • Multiply one-digit whole numbers by multiples of 10 between 10 and 90. For example, 9×80 or 5×60	• Use place value understanding to round multi-digit whole numbers to any place • 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 • Use place value understanding to find the product of two multi-digit numbers • Compare two multi-digit numbers based on meanings of the digits in each place, using the symbols > (more than), = (equal to), and < (less than)	• Use place value understanding to round decimals to any place • Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left • Read, write, and compare decimals based on the meanings of the digits in the tenths, hundredths, and thousandths place, using the symbols >, =, and <

To find the area of this rectangle, students can first break it down into three parts. The length of each part can then be multiplied by the width of 18.
$18(600+40+9) = 18x600+18x40+18x9.$

Partnering with your Child's Teacher

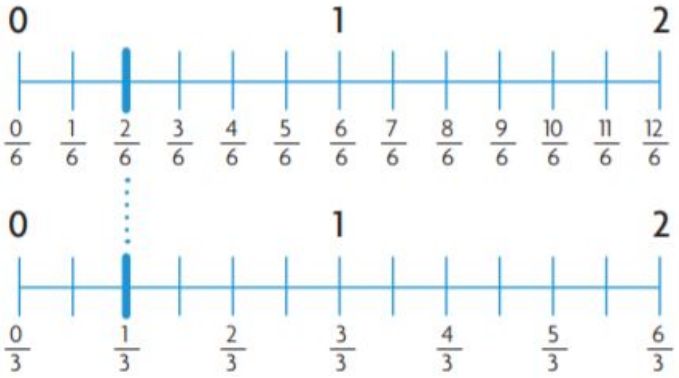
Don't be afraid to reach out to your child's teacher—you are an important part of your child's education. Ask to see a sample of your child's work or bring a sample with you. Ask the teacher questions like:

- Is my child at the level where he/she should be at this point of the school year?
- Where is my child excelling? How can I support this success?
- What do you think is giving my child the most trouble? How can I help my child improve in this area?
- What can I do to help my child with upcoming work?

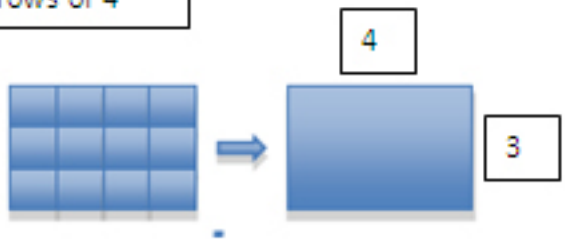
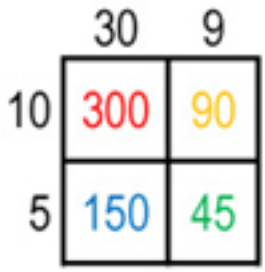
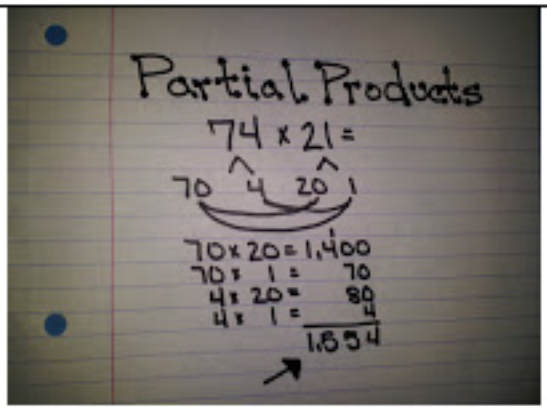
Here are just a few examples of how students will learn about and work with fractions in grade four.

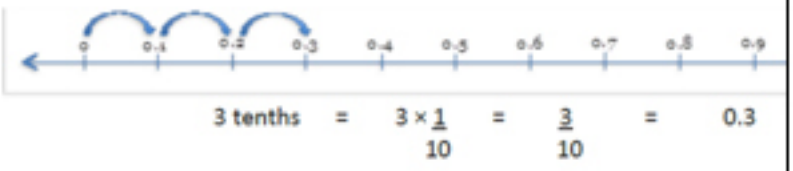
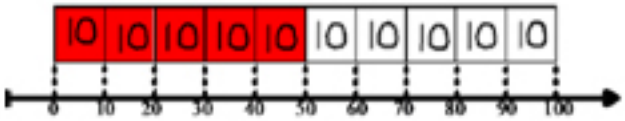
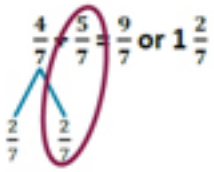
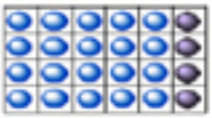
Grade Three Mathematics	Grade four Mathematics	Grade Five Mathematics
• Determine a fraction's place on a number line by defining the length from 0 to 1 as the whole and "cutting it" into equal parts • Understand two fractions as equal if they are the same size or at the same point on a number line • Compare the size of two different fractions of the same size object. For example, which is bigger, ⅛ of a pizza or ⅙ of that same pizza?	• Break down a fraction into smaller fractions with the same denominator, or bottom number, in more than one way (⅜ = ⅛+⅛+⅛ = ⅔+⅛) • Explain why a fraction is equal to another fraction • Add and subtract mixed numbers (whole numbers mixed with fractions, such as 1⅕) with the same denominators • Multiply a fraction by a whole number	• Interpret a fraction as division of the numerator (the top number) by the denominator (the bottom number) • Add and subtract fractions with different denominators • Multiply a fraction by a whole number or another fraction • Divide fractions by whole numbers and whole numbers by fractions

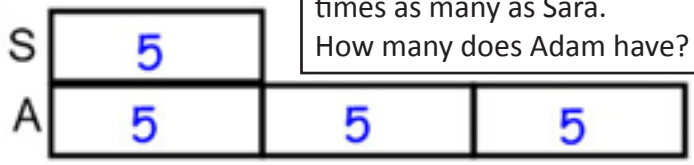
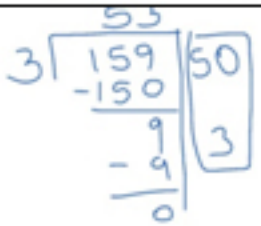
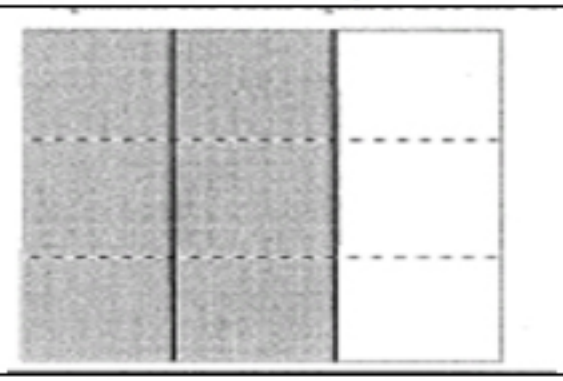
Students will use the number line to break fractions into smaller fractions. This allows them to show, for example, that ⅔=⅓.



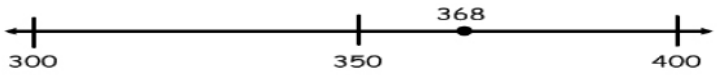
Glossary for 4th Grade Math

Term	Description	Visual Representation
Array	Objects organized into equal rows (going across) and columns (going down)- used for multiplication Illustration shows 3 rows of 4	3 x 4 3 rows of 4 
Area Model for Multiplication	Like the array, without the individual boxes. Strategy used for multiplying. The digits are broken up into their values and multiplied.	39x15  45 150 90 + 300 585
Partial Products	Like the area model, it breaks the each number into values and each is multiplied to the other.	

Number Line	The number line is used to develop a deeper understanding of whole number units, fraction units, measurement units, decimals, and negative numbers. Can be used for solving operations (+, -, x and ÷)	 3 tenths = $3 \times \frac{1}{10}$ = $\frac{3}{10}$ = 0.3
	Using a number line for multiplying	
Decompose	Breaking a number down into smaller parts, to make them easier to manipulate	**Grade 4 Example 1** Decompose $\frac{4}{7}$ into $\frac{2}{7}$ and $\frac{2}{7}$. Add $\frac{2}{7}$ to $\frac{5}{7}$ to make 1 whole. $\frac{2}{7} + \frac{5}{7} = \frac{7}{7}$ Then add $\frac{7}{7}$ to $\frac{2}{7}$. $\frac{7}{7} + \frac{2}{7} = \frac{9}{7}$ or $1\frac{2}{7}$  **398 + 526 = 924** 
Equation	A number sentence consisting of two things that are equal	2 + 5 = 7 33 = 11 x 3
Distributive Property		  4 x 6 = 4 x 5 = 20 + 4 x 1 = 4 20 + 4 = 24

Distributive Property (continued)		5 threes + 2 threes = (5 + 2) threes 3 3 3 3 3 3 3 
Line Plot	A representation of data (like a graph) using a number line and x's to represent the data	 Sara has 5 cookies. Adam has 3 times as many as Sara. How many does Adam have?
Tape Diagram	The tape diagram provides an essential bridge to algebra and is often called "pictorial algebra." They are pictorial representations of relationships between quantities used to solve word problems.	 Grade 5 Example *Sam has 1025 animal stickers. He has 3 times as many plant stickers as animal stickers. How many plant stickers does Sam have? How many stickers does Sam have altogether?*  1. He has 3075 plant stickers. 2. He has 4100 stickers altogether.
Partial Quotients	A strategy used for division.	
Visual/Area model for Fractions	A way to pictorially represent fractions This shows how 2/3 and 6/9 are equivalent	

Example:
Round 368 to the nearest hundred.
This will either be 300 or 400, since those are the two hundreds before and after 368.
Draw a number line, subdivide it as much as necessary, and determine whether 368 is closer to 300 or 400.
Since 368 is closer to 400, this number should be rounded to 400



When students are asked to round large numbers, they first need to identify which digit is in the appropriate place.

Example or reasoning: Round 76,398 to the nearest 1000.

- Step 1: Since I need to round to the nearest 1000, then the answer is either 76,000 or 77,000.
- Step 2: I know that the halfway point between these two numbers is 76,500.
- Step 3: I see that 76,398 is between 76,000 and 76,500.
- Step 4: Therefore, the rounded number would be 76,000.

Example:
There are 25 dozen cookies in the bakery. What is the total number of cookies at the bakery?

Student 2
25 x 12
I broke 25 up into 5 groups of 5
5 x 12 = 60
I have 5 groups of 5 in 25
60 x 5 = 300

Student 3
25 x 12
I doubled 25 and cut 12 in half to get 50 x
50 x 6 = 300

Student 1
25 x12
I broke 12 up into 10 and 2
25 x 10 = 250
25 x 2 = 50
250 +50 = 300

The next three and a half pages were taken from the East Irondequoit website. They include a variety of addition and subtraction strategies that are first introduced to students in K-2 with smaller numbers, and are then extended into the upper elementary grades with bigger numbers. The “traditional” algorithm for addition and subtraction are introduced in 4th grade. We no longer use the terms borrowing and carrying, we actually haven’t used them for years. The proper term is regrouping.

Strategies for Addition

1. **Breaking Apart** (Place Value), also known as "Separating" or "Decomposing"

Break both numbers down to place value and add each, starting with the largest:

46 + 25 =

46 breaks into 40 plus 6 (40 + 6), 25 breaks into 20 plus 5 (20 + 5)

40 + 20 = 60

6 + 5 = 11

60 + 11 = 71

Or:

Keep one number intact and only break second number down by place value and adding each place:

46 + 25 =

46 stays intact and 25 breaks into 20 and 5

46 + 20 = 66

66 + 5 = 71 or *66 + (4 + 1)

*Note: some students may prefer to break the 5 apart (4 + 1) so that they can add 4 to 66 and get 70, then add on 1. It would only make sense to break down the ones to get to the "landmark" number 10.

2. **Compensation:**

Round one or more of the numbers to numbers that are easier to work with, then compensate:

256 + 687

+13

256 + 700 = 956

956 - +13 =

(decompose 13)

956 - 10 = 946

946 - 3 = 943

13 is added to **687** to get 700, an easier number to work with - keeping track of the adjustment is critical to making this strategy work, encourage students to box the adjustment (here we box the adjustment as -13 since 13 was added , **now 13 must be subtracted** out of the computation to get the final answer.

3. **Transformation:**

Transform the problem into an equivalent problem that is easier: (like compensation, this is a strategy more advanced math thinkers can handle, you're adding to one and taking away the same amount from the other)

a. 46 + 28 = ___

adding 2 to 28 makes it 30, an easy number to work with but if 2 is added into this equation, then 2 must be subtracted from the 46.

28 + 2 = 30

46 – 2 = 44

30 + 44 = 74

b. 256 + 687 =

add 13 to 687 to make it 700, subtract 13 from 256 to make it 243, 700 + 243 = 943

More Subtraction Strategies

1 **Breaking Apart/Separating:**

Subtract one number in parts from the other number which stays intact, always starting with largest place value to subtract .

a. 54 – 23 =

23 can be broken into 20 + 3

54 – 20 = 34

34 – 3 = 31

or 56 – 29 =

29 can be broken into 20 + 6 + 3, breaking 9 into 6 + 3 makes it easier to subtract

56 – 20 = 36

36 – 6 = 30

30 – 3 = 27

b. 547 – 297 =

keep 547 intact, break 297 into 200 + 90 + 7, subtract out one place value at a time

547 – 200 = 347

347 – 90 = 257

257 – 7 = 250

or 547 – 297 = _____, break 297 into 247 + 50, subtract out each part

547 – 247 = 300 , 300 – 50 = 250

2. Adding Up/Counting On:

Start with smaller number, add up to a landmark number*, from the landmark add up to get to the target number. Add the two numbers you used.

212 – 197 =

197 + 3 = 200*

200 +**12** = 212

3 + 12 = 15

516 – 305 =

305 + **195** = 500*

500 + **16** = 516

195 + 16 = 211 (195 + 10 = 205, 205 + 6 = 211)

3. **Subtracting across the zeros:**

Adding up is a good strategy when one of the subtrahends involves 0's. Students have a great deal of difficulty subtracting across the zeros.

$10.00 – $4.75 =

Think: $4.75 + $.25 = $5.00

$5.00 + $5.00 = $10.00

$5.00 + $.25 = $5.25

4. **Subtracting from 9's:**

Given 1,000 – 273:

(subtract 1 from 1,000 making it 999 – subtracting from 9's doesn't require any regrouping)

999 +1 *box the adjustment to remember to add it back in*

-273

726 +1 *now add back the 1, the answer is 727*

Given 1006 – 273 :

(subtract 7 from 1006 making it 999,

999 +7

– 273

726 +7 *now add back the 7 making the answer 733*

3. **Transformation**

Transform the entire problem to an equivalent problem that is easier to solve by adding or subtracting the same number from/to both numbers in the subtraction problem. (Using the same number maintains the difference between the two numbers.) The goal of adding or subtracting a number is to make one or more of the numbers easier to work with.

547 – 297 =

add **3** to both numbers to bring **297** to **300** and **547** to **550**, now 300 is an easier number to subtract from 550

550 - 300 = 250

4. **Compensation**:

Adjust one of the numbers in a math problem in order to make them easier to work with.

a. 45 – 27 =

27 - 2 = 25

45 – 25 = 20

20 + 2 = 18

→ You ignored 2 out of the 27 so you need to subtract 2 out of the answer.

b. 45 – 27 =

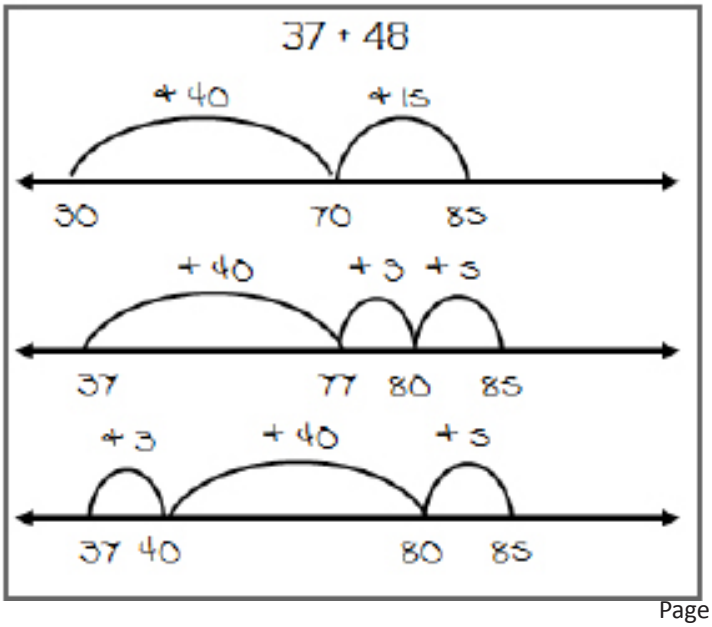
45 + 2 = 47

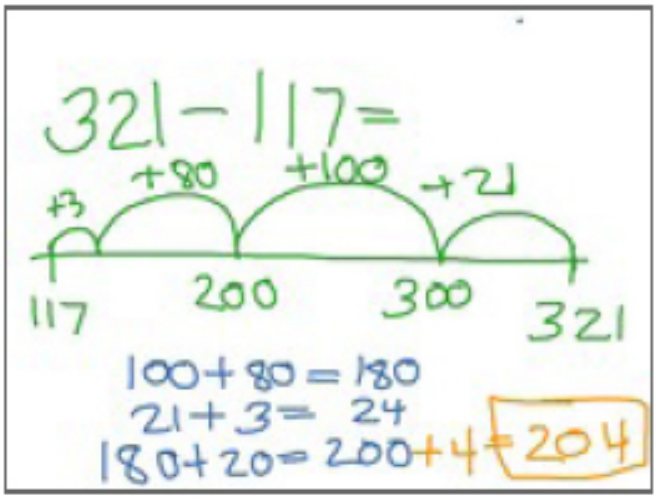
47 – 27 = 20

20 – 2 = 18

→ You added 2 to 45 so you need to subtract 2 out of the answer.

Open or Numberless Number Line (A strategy for addition or subtraction.)

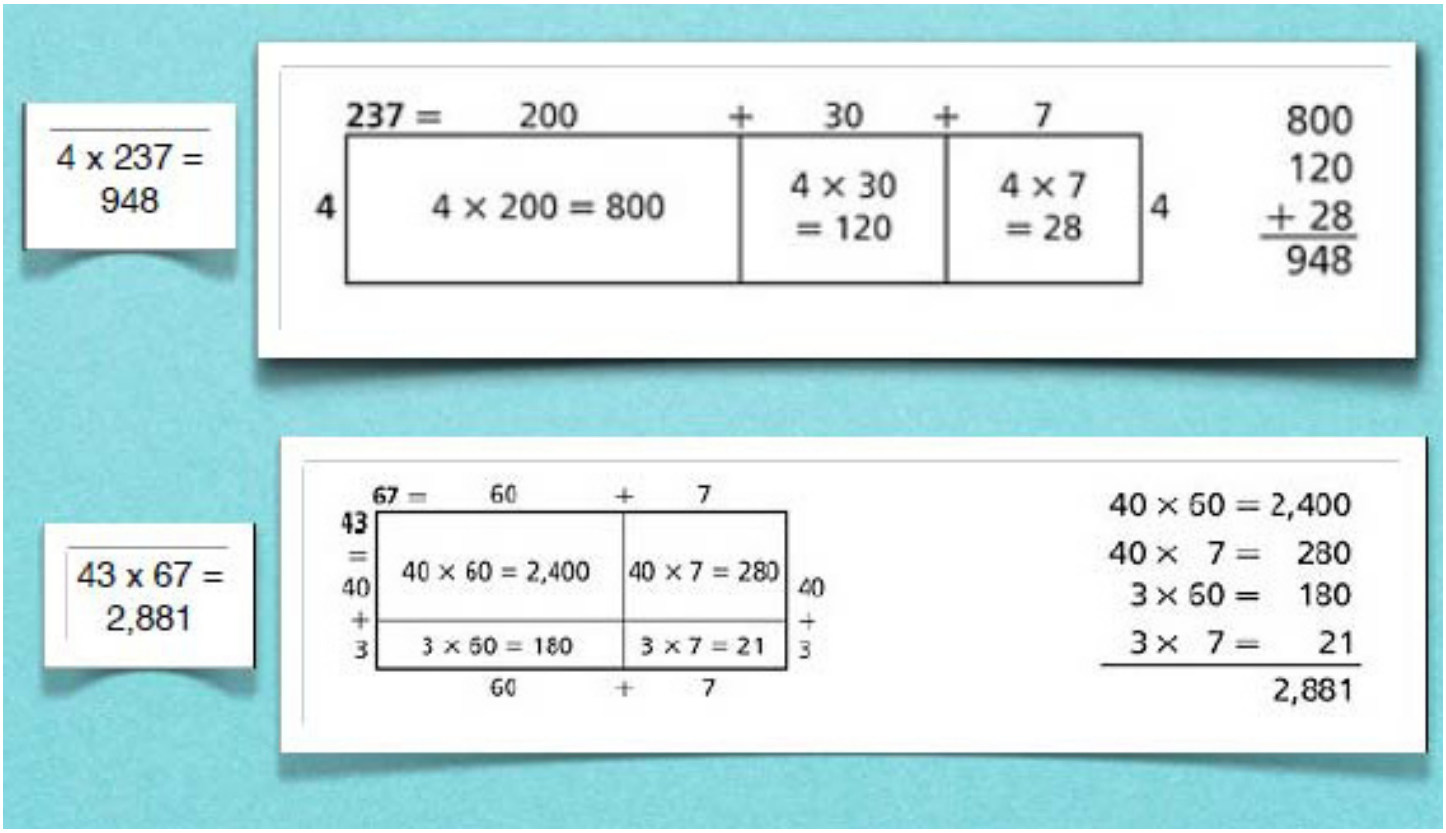




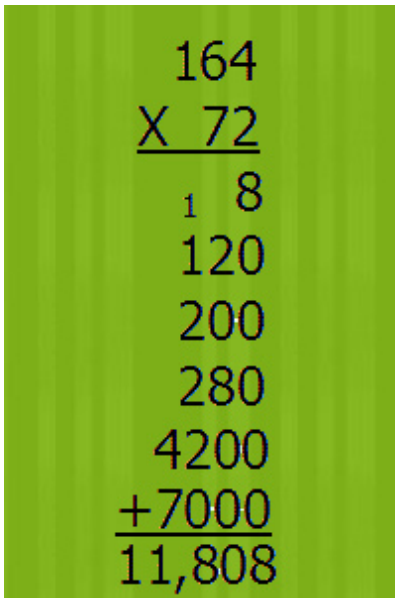
There are several ways to use an open number line for both addition and subtraction.

Multiplication Strategies

Rectangular Area Models:



More Partial Product Multiplication Strategies

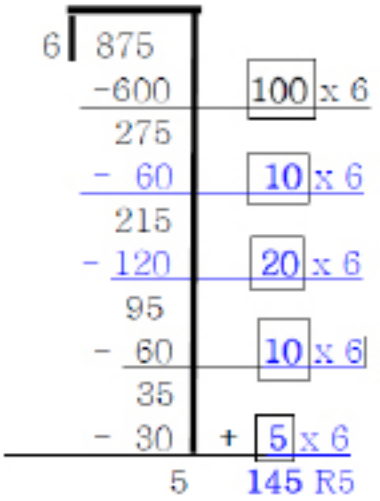


http://ellerbruch.nmu.edu/classes/cs255f04/cs255students/jbowerman/P10/PartialProduct

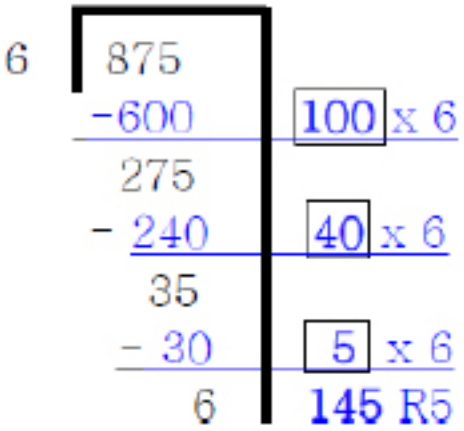
http://everydaymath.uchicago.edu/teaching-topics/computation/multi-part-prod/

Division Strategies

Partial Quotients Models:



As the students become fluent in multiples of the divisor and the powers of 10, this becomes a very efficient strategy.



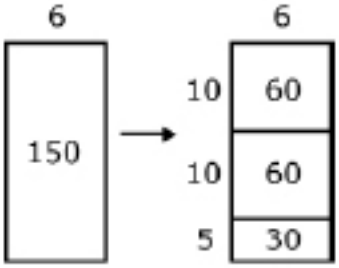
Student 1	**Student 2**	**Student 3**
592 divided by 8 There are 70 8's in 560 592 - 560 = 32 There are 4 8's in 32 70 + 4 = 74	592 divided by 8 I know that 10 8's is 80 If I take out 50 8's that is 400 592 - 400 = 192 I can take out 20 more 8's which is 160 192 - 160 = 32 8 goes into 32 4 times I have none left I took out 50, then 20 more, then 4 more That's 74	I want to get to 592 8 x 25 = 200 8 x 25 = 200 8 x 25 = 200 200 + 200 + 200 = 600 600 - 8 = 592 I had 75 groups of 8 and took one away, so there are 74 teams

592	
-400	50
192	
-160	20
32	
-32	4
0	

Open Array or Area Models

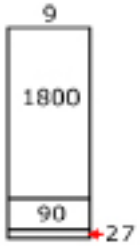
Example A:

150 ÷ 6



Example B:

1917 ÷ 9



A student's description of his or her thinking may be:

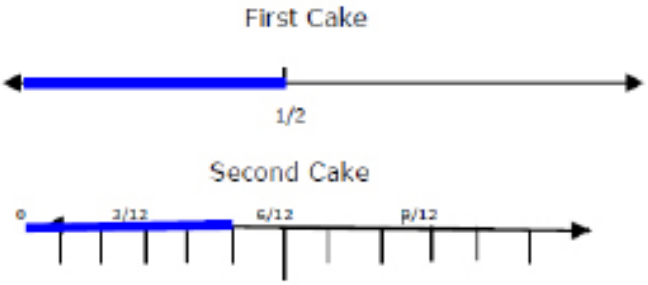
I need to find out how many 9s are in 1917. I know that 200 x 9 is 1800. So if I use 1800 of the 1917, I have 117 left. I know that 9 x 10 is 90. So if I have 10 more 9s, I will have 27 left. I can make 3 more 9s. I have 200 nines, 10 nines and 3 nines. So I made 213 nines. 1917 ÷ 9 = 213.

Fraction Examples

Example:
There are two cakes on the counter that are the same size. The first cake has ½ of it left. The second cake has 5/12 left. Which cake has more left?

Student **1**
Area model:
The first cake has more left over. The second cake has 5/12 left which is smaller than ½.

Student 2
Linear/Number Line model:

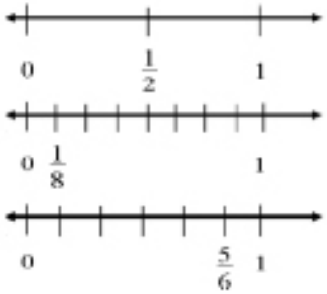


Student 3:
I know that 6/12 equals 1/2. Therefore, the second cake which has 7/12 left is greater than 1/2.
Benchmark fractions include common fractions between 0 and 1 such as halves, thirds, fourths, fifths, sixths, eighths, tenths, twelfths, and hundredths.

Fractions can be compared using benchmarks, common denominators, or common numerators. Symbols used to describe comparisons include <, >, =.

It is important that students explain the relationship between the numerator and the denominator, using Benchmark Fractions. See examples below:

Fractions may be compared using $\frac{1}{2}$ as a benchmark.



Fraction Examples, cont.

Possible student thinking by using benchmarks:

- $\frac{1}{8}$ is smaller than $\frac{1}{2}$ because when 1 whole is cut into 8 pieces, the pieces are much smaller than when 1 whole is cut into 2 pieces.

Possible student thinking by creating common denominators:

- $\frac{5}{6} > \frac{1}{2}$ because $\frac{3}{6} = \frac{1}{2}$ and $\frac{5}{6} > \frac{3}{6}$

Fractions with common denominators may be compared using the numerators as a guide.

- $\frac{2}{6} < \frac{3}{6} < \frac{5}{6}$

Fractions with common numerators may be compared and ordered using the denominators as a guide.

$$\frac{3}{10} < \frac{3}{8} < \frac{3}{4}$$

Websites for Parents

For more information on the Common Core State Standards for mathematics, go to www.corestandards.org/about-the-standards/key-points-in-mathematics or www.commoncoreworks.org.

For more information on the standards in mathematics related to place value (Number and Operations in Base Ten) or fractions, go to commoncoretools.me/category/progressions/.

For more information on helping your child learn mathematics (with activities from pre-school to grade five), go to www2.ed.gov/parents/academic/help/math/index.html.

For the full text of the Common Core Learning Standards go to: www.p12.nysed.gov/ciai/ common_core_standards/pdfdocs/nysp12cclsmath.pdf

Additional websites:

www.EngageNY.org

illuminations.nctm.org

www.kahnacademy.org

www.pbs.org/parents/earlymath/

Helping Your Children with Homework

"The first teachers are the parents, both by example and conversation." Lamar Alexander

In helping children learn, one goal is to assist children in figuring out as much as they can for themselves (e.g., constructing meaning). You can help by asking questions that guide, without telling what to do.

Good questions and good listening will help children make sense of mathematics, build selfconfidence, and encourage mathematical thinking and communication. A good question opens up a problem and supports different ways of thinking about it. Here are some questions you might try; notice that none of them can be answered with a simple "yes" or "no."

Getting Started

- What do you need to find out?
- What do you need to know?
- How can you get that information?
- Where can you begin?
- What terms do you understand or not understand?
- Have you solved similar problems that would help?

While Working

- How can you organize the information?
- Can you make a drawing (model) to explain your thinking?
- Are there other possibilities?
- What would happen if…?
- Can you describe an approach (strategy) you can use to solve this?
- What do you need to do next?
- Do you see any patterns or relationships that will help solve this?
- How does this relate to…?
- Can you make a prediction?
- What did you…?
- What assumptions are you making?

Reflecting about the solution

- How do you know your solution (conclusion) is reasonable?
- How did you arrive at your answer?
- How can you convince me your answer makes sense?
- What did you try that did not work?
- Has the question been answered?
- Can the explanation be made clearer?

Responding (helping your children clarify and extend their thinking)

- Tell me more
- Can you explain it in a different way?
- Is there another possibility or strategy that would work?
- Help me understand this part . . .

Websites for 4th Graders

www.xtramath.org

www.multiplication.com/games

www.ictgames.com/

www.eduplace.com/math/mthexp

www.aplusmath.com/

www.aaamath.com/

mathforum.org/dr.math/

www.coolmath4kids.com/

www.funbrain.com/

www.mathstories.com/

www.teachrkids.com/

www.eduplace.com/math/brain/index.html

www.mathplayground.com/wordproblems.html

Resources Used in this Publication

East Irondequoit, NY CSD, www.eastiron.org, Parent Center Link on Left

EngageNY, www.engageny.org

Hudsonville, MI CSD Parent Presentation, www.hudsonville.k12.mi.us

Kansas Association of Teachers of Mathematics (KATM) Flip Books, www.katm.org

New York State Education Department, Common Core Learning Standards for Mathematics, K-12

Parent Roadmap: Supporting Your Child in Grade Two Mathematics, Council of the Great City Schools, Washington, D.C.; www.cgcs.org