Your family is invited to attend...

Phelps Luck Elementary School's

2nd Annual

Creative Strategies for Math at Home Series

Why?	Who?	When?
Come check out how math instruction looks in the 21st Century classroom. We will look at how students are learning to solve computation both mentally and with creative strategies on paper.	All Phelps Luck Families Grades 1-5 Separate sessions are planned for children and adults.	**Mental Math** Thursday, October 9th 6:30 – 7:30 **Basic Fact Night** ✪ Families of Students Learning 3rd Grade Math Only✪ Thursday, October 23rd 6:30 – 8:00 **Addition and Subtraction** Thursday, November 6th 6:30 – 8:00 **Multiplication and Division** Thursday, November 20th 6:30 – 8:00

Student Name(s): ______________________________ Grade(s): __________

________ Yes! We will attend! Number of family members attending: ________

You may attend any or all of the sessions, each evening will be focused on the topics above.

Circle the night(s) you will be attending:

October 9th October 23rd November 6th November 20th

_________ Check here for transportation (taxi) to be provided to and from school

_________ Interpreter (Language: ____________________)

_________ Childcare for NON School Age Child

Please return this form by Friday, September 26th to Mrs. Krownapple

RE: Math Night Series

Sample Evaluation for Parent Feedback

Phelps Luck Elementary School
Howard County Public School System
FAMILY PROGRAM EVALUATION

Name of program: Grade 3 Just the Facts Night   Date: Thursday, October 23rd

Presenters: The 3rd Grade Math Team & The PLES Math Team

Please circle your response to the following statements:

1. I understood the program topic.

Strongly Agree   Agree   Disagree   Strongly Disagree

2. I felt the information was presented clearly.

Strongly Agree   Agree   Disagree   Strongly Disagree

3. I was able to engage in the activities presented.

Strongly Agree   Agree   Disagree   Strongly Disagree

4. I will be able to use the information presented with my child at home.

Strongly Agree   Agree   Disagree   Strongly Disagree

***5. I plan on using the take-home materials with my child.**

Strongly Agree   Agree   Disagree   Strongly Disagree   N/A

***6. Title I provides additional funds for family involvement. Do you feel this program was a good use of these funds?**

Strongly Agree   Agree   Disagree   Strongly Disagree

Please rate the overall effectiveness of today's program:

Very Effective		Somewhat Effective		Not Effective
5	4	3	2	1

ADDITIONAL COMMENTS, CONCERNS, CONSIDERATIONS.

Mental Math Strategies

PLES Math Team 2014-2015

Mental Math Night
October 9, 2014 6:30 - 7:30

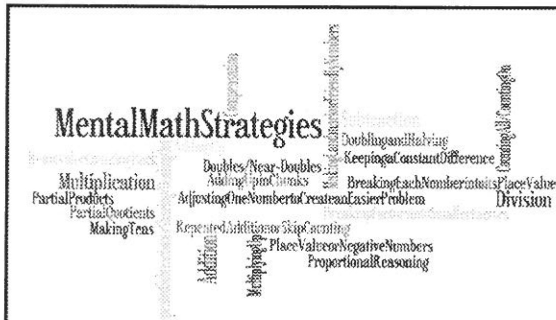
I. Introduction/Rationale
  a. Understanding Common Core
  b. What is Mental Math?
  c. Mental Math Strategies
II. Mental Math and Testing
  a. MAP example
  b. PARCC example
III. Mental Math Resources
  a. Greg Tang Video Clip
  b. Website
  c. Printable Games
  d. Literature
IV. Did You Know? Video Clip
V. Visit Computer Lab
VI. Evaluation

Understanding Common Core

The following clip will provide insight to the change of the State Curriculum to the Common Core Curriculum.

What is Mental Math?

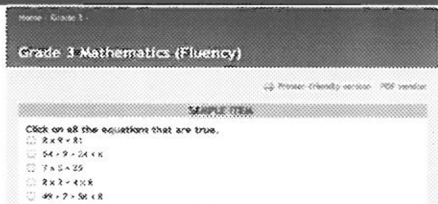
Calculations that are done in a student's head without the guidance of pencil and paper, calculators, or other aids. Mental math is often used as a way to calculate and estimate quickly, using math facts that a student has committed to memory.



How does Mental Math connect to Map?
Grades 2-5 MAP example

Would you like to see more: Visit: http://www.nwea.org/warmup/sample_tests/map_short.html

How does Mental Math connect to PARCC? Grade 3 PARCC Example



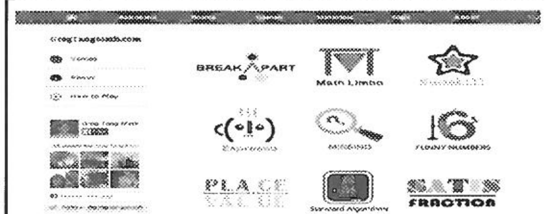
Would you like to see more? Visit: http://practice.parcc.testnav.com/

Mental Math Resource

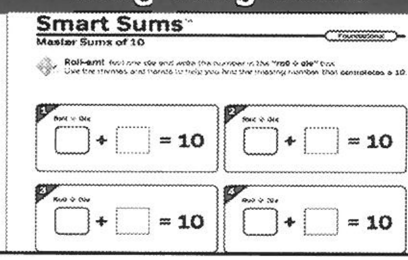
Greg Tang is invested in creative mental math strategies. He shares his strategies via literature, websites, and games.

Check this out!

Greg Tang Website



Greg Tang Game



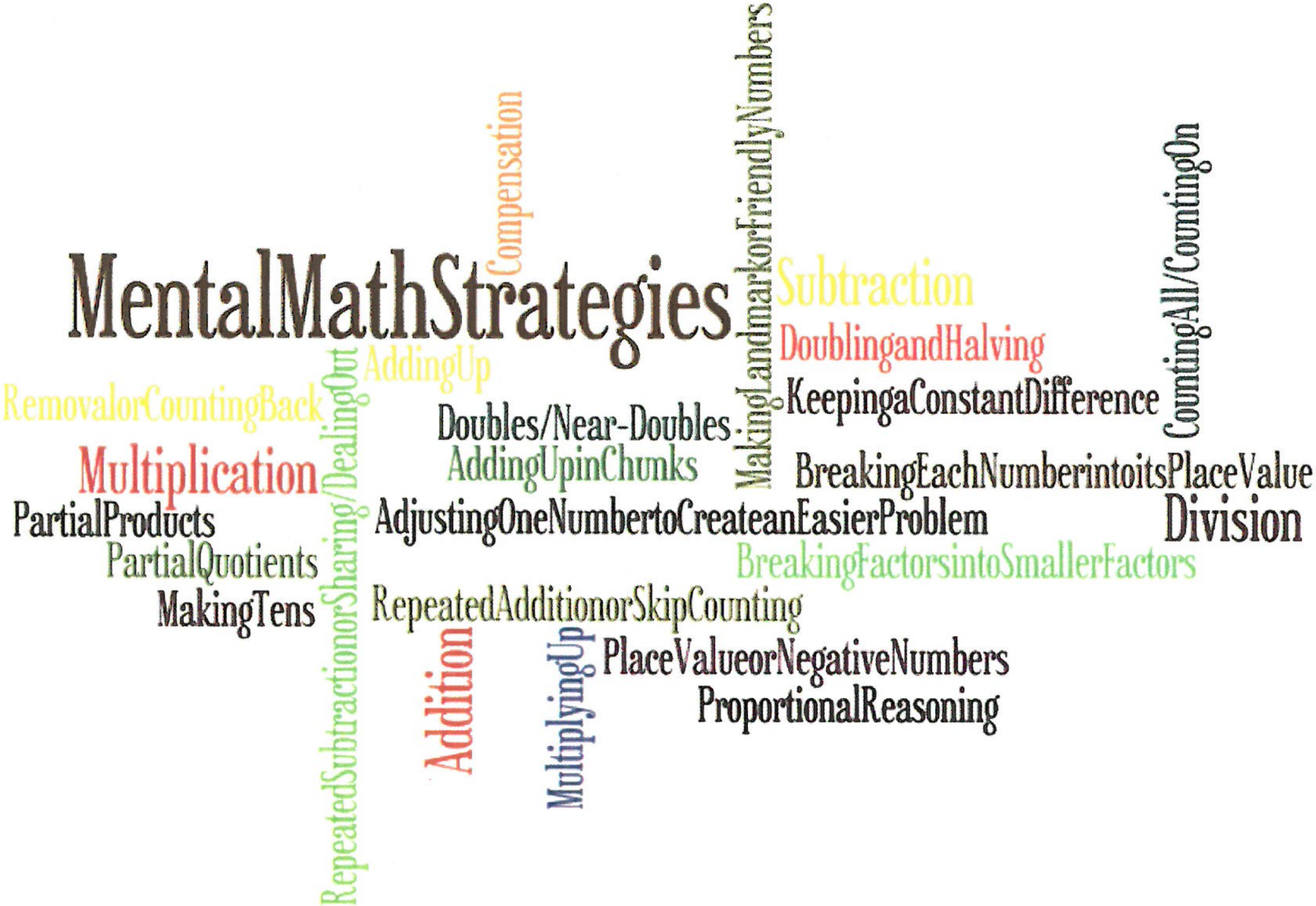
Greg Tang Literature

Final Thoughts...

Did you know?

Math Series! Mark your calendars

- Grade 3 Basic Fact Night - Thursday, October 23rd @ 6:30
- Addition and Subtraction Night - Thursday, November 6th @ 6:30
- Multiplication and Division Night - Thursday, November 20th @ 6:30


MentalMathStrategies
Compensation
MakingLandmarkorFriendlyNumbers
Subtraction
DoublingandHalving
KeepingaConstantDifference
CountingAll/CountingOn
AddingUp
RemovalorCountingBack
Doubles/Near-Doubles
AddingUpinChunks
Multiplication
BreakingEachNumberintoitsPlaceValue
PartialProducts
AdjustingOneNumbertoCreateanEasierProblem
Division
PartialQuotients
BreakingFactorsintoSmallerFactors
MakingTens
RepeatedAdditionorSkipCounting
RepeatedSubtractionorSharing/DealingOut
Addition
MultiplyingUp
PlaceValueorNegativeNumbers
ProportionalReasoning

Part 1

Just the Facts Night
Grade 3
Phelps Luck Elementary
October 23, 2014
6:30 – 8:00

Agenda:

- **Presentation with Rationale**
  - Located in Cafeteria 6:30-6:45
  - Review importance of fact proficiency
  - Share goals for the evening

- **Rotation:**
  1. **6:45 -- 7:05**
  2. **7:05 -- 7:25**
  3. **7:25 – 7:45**

  1: Wendy Crockett, Karen Simcock (Wendy's Room)
  - SAW Games

  2: Gretchen Gray, Casey Morseberger (Gretchen's Room)
  - Card and Dice Games

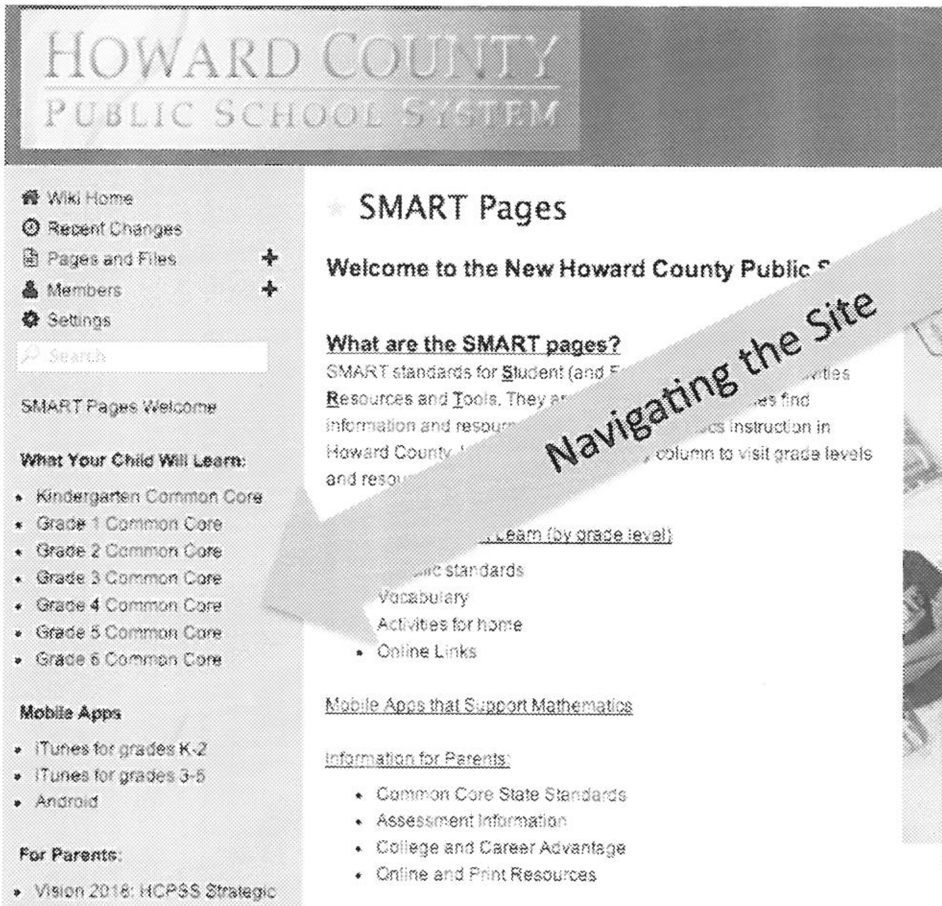
  3: Kelly Fleck (iMac Lab)
  - Intro to Smart Pages
  - Ipad and Iphone Apps
  - Math Fact Websites
  - www.xtramath.com

Juli and Kelly Krownapple - help with rotation transitions

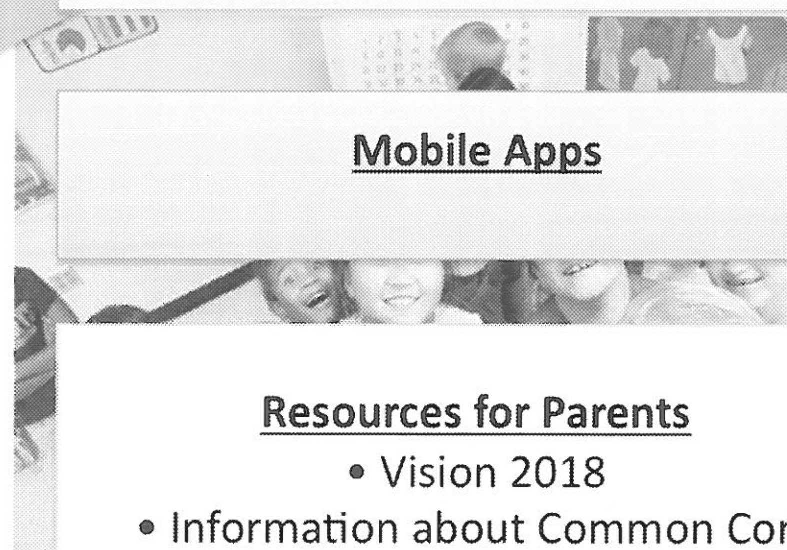
- **Conclusion**
  - Located in the Cafeteria 7:45-8:00
  - Parents fill out feed back forms.

How can I help my child? : SMART PAGES

http://smart.wikispaces.hcpss.org



What Your Child Will Learn
- skills/concepts taught
- vocabulary
- activities at home
- links for games



Mobile Apps

Resources for Parents
- Vision 2018
- Information about Common Core
- Books

Websites for Basic Fact Practice: +, -, x, ÷

www.funbrain.com/math/

http://www.mathfactcafe.com/

http://www.multiplication.com/games/all-games

http://www.factmonster.com/

http://www.playkidsgames.com/games/mathfact/mathFact.htm

http://www.aplusmath.com/games/index.html

http://www.coolmath4kids.com/

http://www.fun4thebrain.com/

http://www.arcademics.com/

http://www.learninggamesforkids.com/math_multiplication_games.html

http://xtramath.org/

Creative Strategies for Math at Home
Addition and Subtraction

Tonight's Agenda 11/6/14

6:30 – 6:55 Technology Session

7:00 – 7:25 Rotation 1

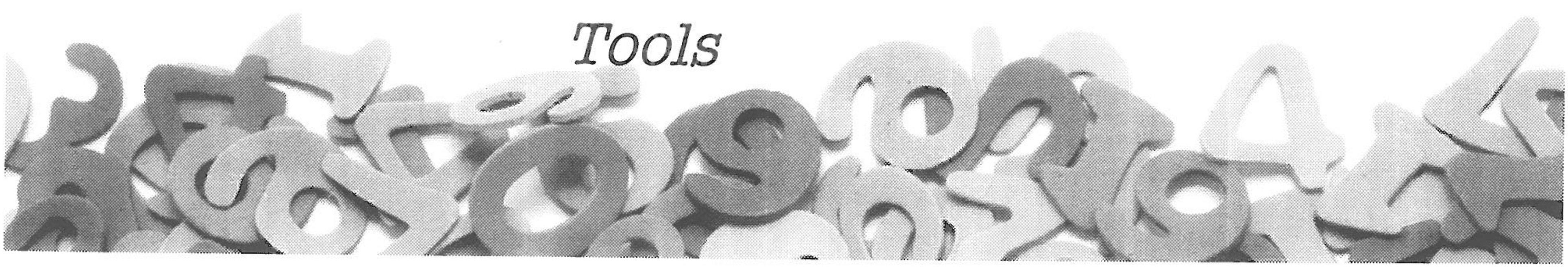
Partial Sums & Differences

Tools

7:30 – 7:55 Rotation 2

Partial Sums & Differences

Tools



LearnZillion

Go to www.learnzillion.com.

LearnZillion is a website that provides teachers and parents with video lessons showing what your student needs to learn each year. The lessons include a 3-5 minute long lesson video, downloadable slides, and other resources for practice and assessment.

Your student can watch the videos alone or with you.

Some things to consider while watching the video:

- What is this lesson about?
- Review
- Mistakes to avoid
- The main thing to learn

You may also work on the "guided practice" video or other activities that come with the lesson.

Thank you for supporting your student's learning at home.

Adding and Subtracting with Partials

37 + 62

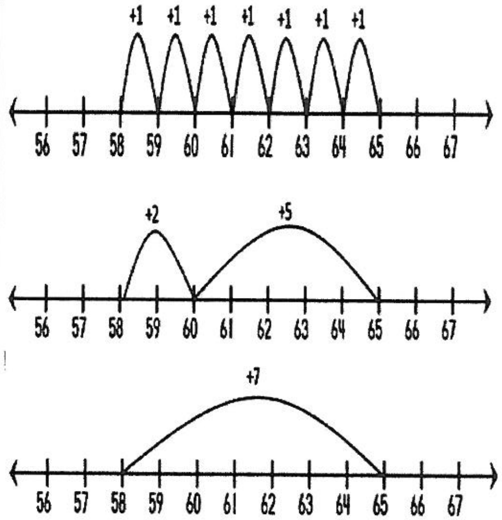
827 + 149

97 - 45

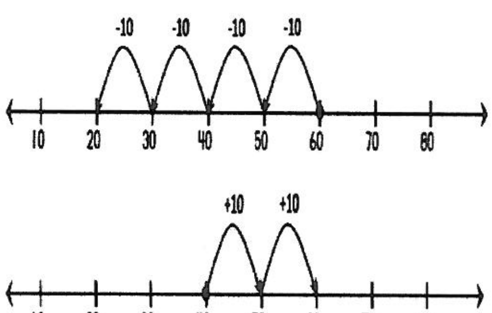
745 - 231

Addition and Subtraction on Number Lines

Number lines are useful for adding and subtracting. At first, students will jump in increments of 1. They will develop more efficient strategies and jumps as their number sense improves. This experience develops mental math skills and supports work with algorithms. These number lines show 58 + 7 with jumps of 1, by breaking 7 apart, and one single jump.



When subtracting, we can count back from a number or we can count up from one number to another to find the difference. The number lines show examples for 60 - 40.



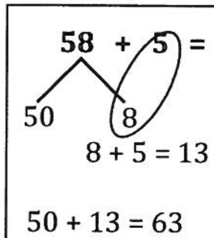
Addition: Partial Sums

Students may break numbers apart to add tens with tens and ones with ones. They find "parts" of the sum and can then combine to find the total sum.

58 + 5 =

50 + (8 + 5)=

50 + 13 = 63



Subtraction: Place Value

Students apply their knowledge of subtracting single digit numbers and place value to subtract multiples of 10.

50 – 20 = 30

5 – 2 = 3

5 tens – 2 tens = 3 tens

50 - 20 = 30

Addition: Properties

Students can add numbers by using the properties of addition to rearrange or group the numbers.

Commutative Property
rearranging the numbers
8 + 6 = 6 + 8

4 + 8 + 6 =

4 + 6 + 8 =

10 + 8 = 18

Associative Property
grouping the numbers
4 + 6 + 8

Developing Computational Fluency

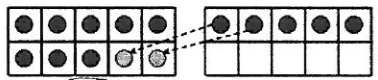
Grade 1

Elementary Mathematics Office
Howard County Public School System

This brochure highlights some of the methods for developing computational fluency. For more information about computation and elementary mathematics visit http://smart.wikispaces.hcpss.org

Addition: Making Tens

Making tens is an important strategy for fluency. Students work with ten-frames (below). They combine dots to fill a ten-frame. Below, we moved 2 dots from 5 to make a ten. The result is 10 + 3.



8 + 5

2 3

10 + 3

We can apply the combinations of tens to add other numbers. In 58 + 5, we might break apart 5 into 2 + 3 and then add the 2 to 58 making the next ten which is 60.

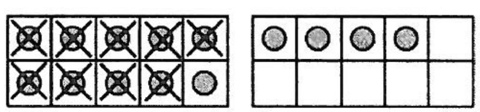
58 + 5

2 3

60 + 3

Subtraction Using Ten Frames

We can also use tens for subtraction. The ten-frame below shows 14. To subtract 14-9, we can break 9 into 4 and 5. We can subtract the 4 from 14 giving us 10. Then, 5 less than 10 is 5. Eventually, this will become automatic for students.



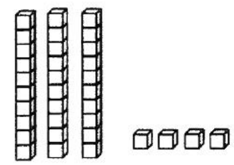
14 - 9

4 5

14 – 4 = 10, then 10 – 5 = 5

So, 14 – 9 = 5

Working with Base Ten Blocks



34

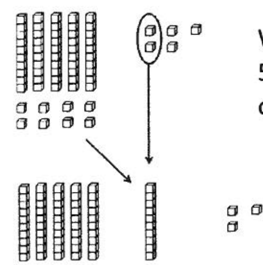
Base ten blocks are a math tool that help us build numbers. The rod is equal to 10 and the single cube is equal to 1.

Addition with Base Ten Blocks

58 + 5

58 is 5 tens 8 ones

We add 5 more ones.



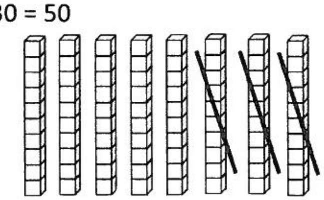
We combine ones to make a new ten.

In 58 + 5, we make a new ten from the ones (8 + 2). This leaves us with 6 tens and 3 ones leftover. So, 58 + 5 = 63

Subtraction with Base Ten Blocks

80 – 50

In first grade, we work with taking tens from tens. Below, there are 8 tens (80) and we take away 3 tens (30) leaving 5 tens (50). So, 80 - 30 = 50



Hundreds Chart

The hundreds chart is a useful math tool. Students can add and subtract on the hundreds chart.

14 + 30 = 44

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

A student started at 14 and jumped down 3 rows of 10 (30) to equal 44.

90 – 40 = 50

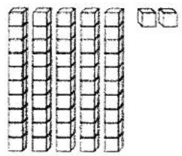
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

A student started at 90 and jumped up 4 rows of 10 (40) to equal 50.

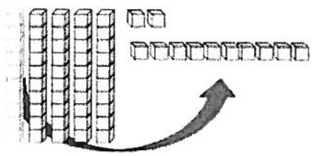
Subtraction: Regrouping

Sometimes a problem requires a group of ten to be regrouped so that ones can be taken away. Consider 52 - 28

This is 52. There aren't enough ones to take away.



This is 52 after regrouping 1 ten to make 4 tens and 12 ones.



Now, we can take away 8 ones from 12 ones.

Subtraction: Adjusting

We can use "friendlier numbers" to solve problems. 500 – 239 can be challenging to regroup. But the difference between these numbers is the same as the difference between 499 – 238. Now, we don't need to regroup.

(Original problem)	**500**	-	**239 =**
(Compensation)	- 1		- 1
	499	-	238 = 261

Subtraction: Unknown Addend or Think Addition

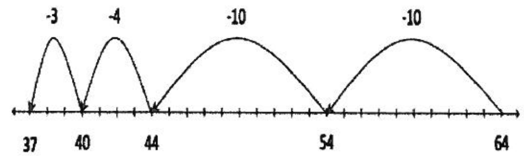
Many people think of subtraction as unknown addition problems. Instead of finding the difference, they think about what the missing addend is. Consider the problem below.

(Original problem) **347 – 249 = ?**

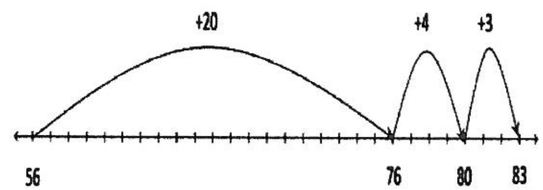
(Think Addition) "249 plus what number equals 347?" **249 + ? = 347**

Subtraction: Number Line

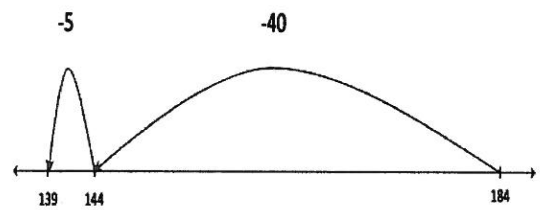
Counting Back on the Number Line:
Consider **64 – 27**. We can start at 64 and count back using friendly numbers. After counting back 27, we land on 37. So, 64-27 = 37.



Counting Up on the Number Line:
Consider **83 – 56**. Another strategy is to find the difference by counting up. To do this, start with 56 and count up to 83. We can add 20, add 4, and add 3 (27).
So, 83 – 56 = 27.



Using an Open Number Line:
Students begin to work with open or empty number lines as they become more comfortable with numbers and number lines. These number lines do not have individual tick marks. Consider 184 – 139 = 45.



Developing Computational Fluency

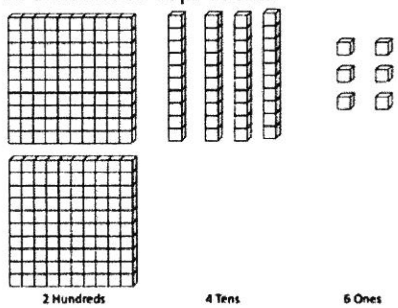
Grade 2

Elementary Mathematics Office
Howard County Public School System

This brochure highlights some of the methods for developing computational fluency. For more information about computation and elementary mathematics visit http://smart.wikispaces.hcpss.org

Working with Base Ten

Computation in 2nd grade is grounded in place value. Students need to understand what the digits in a number represent.

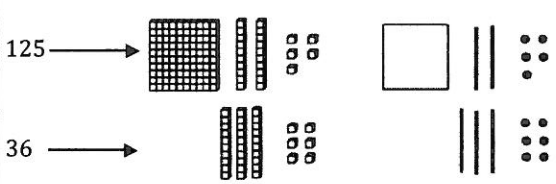


The image above shows 246 as 2 hundreds, 4 tens, and 6 ones. We must understand that numbers can be taken apart in different ways to use them efficiently. Some other ways to think about 246 include:

- 2 hundreds, 4 tens, and 6 ones (200 + 40 + 6)
- 23 tens and 16 ones (230 + 16)
- 22 tens and 26 ones (220 + 26)
- 1 hundreds, 14 tens, and 6 ones (100 + 140 + 6)

Addition with Base Ten Blocks

We use base ten blocks when beginning to learn addition. Students may progress to drawing pictures of these blocks with sticks and dots. Later, students work with numbers only. Each picture below shows 125 + 36.

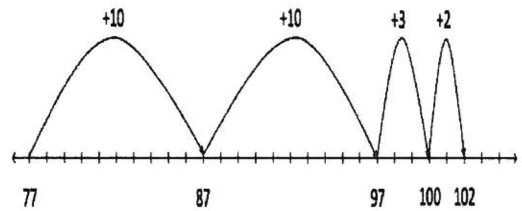


125 + 36 with base ten blocks.

125 + 36 with sticks and dots.

Addition with Number Lines

Number lines are useful for adding numbers. Students use them as they transition away from blocks. Numbers can be broken apart and added in different ways. The number line below shows one way to add 77 + 25.



Addition with Partial Sums

We can break apart addends by place value and then add the parts. This gives us partial sums that we can add back together at the end.

Consider 248 + 345

248	=	200 + 40 + 8
+ 345	=	300 + 40 + 5
		500 + 80 + 13
		500 + 93
		593

Partial sums is a strategy many people use to add numbers mentally.

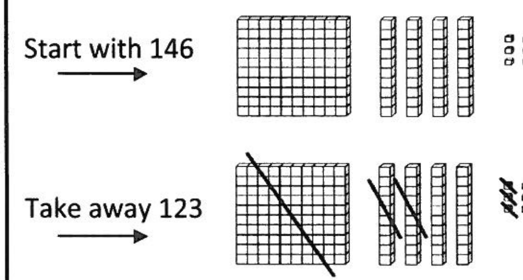
Addition: Adjusting

Sometimes, it makes sense to give a value from one addend to the other for a "more friendly" problem.

Consider 28 + 37	Consider 49 + 27
28 + 37 = 65	49 + 27 = 76
+2 -2	+1 -1
30 + 35 = 65	50 + 26 = 76

Subtraction with Base Ten Blocks

We begin with the total amount when subtracting with base ten blocks. Consider 146 – 123. We begin with 146. We take away or cross off 123. We are left with 23. So, 146 – 123 = 23.



23 are left

Subtraction: Partial Differences

Sometimes, it is more efficient to break apart a number and subtract the parts.

Consider 436 - 128

We might break 128 into (**100** + **20** + **8**).

436 – **100** = 336
336 – **20** = 316
316 – **8** = 308.

So, 436 – 128 = 308

Consider 847 - 637

We don't have to use place value.
We might break 637 into (**600** + **37**).

847 – **600** = 247
247 – **37** = 210

So, 847 – 637 = 210

Creative Strategies for Math at Home
Multiplication and Division Alternative Algorithms
Thursday, November 20, 2014
Phelps Luck Elementary School

6:30 - 6:40 Welcome and Travel to Rooms
PPT showing with kids doing math!

6:40 - 7:15 Rotation 1
Partial Products (Kelly K. and Karen)
Wendy Crockett's Room

7:15 - 7:50 Rotation 2
Partial Quotients (Gretchen and Kelly F.)
Gretchen Gray's Room

Developing Computational Fluency

Grade 3

Elementary Mathematics Office
Howard County Public School System

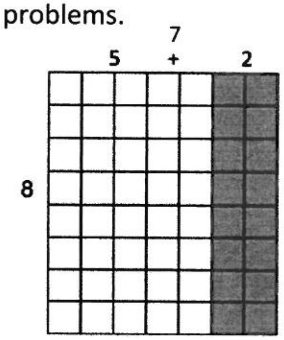
This brochure highlights some of the methods for developing computational fluency. For more information about computation and elementary mathematics visit http://smart.wikispaces.hcpss.org

Multiplication: Area/Array Model

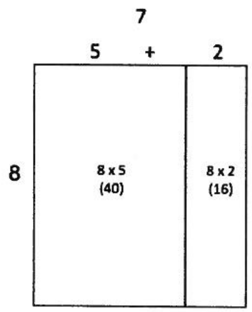
The area/array model for multiplication and the distributive property are used to solve multiplication problems.

Model for 8 x 7:

8 x 7 =
(8 x 5) + (8 x 2) =
40 + 16 =
56



This is the same model without inner squares. It is considered an "open model."



Students move from area/array models to working with partial products and the distributive property.

8 x 7
(8 x 5) + (8 x 2)
40 + 16
56

Multiplication: Multiples of 10

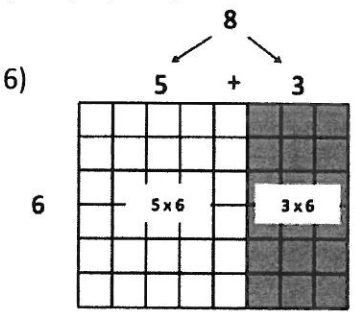
3 x 1 = 3	3 x 4 = 12
3 x 1 ten = 3 tens	3 x 4 tens = 12 tens
3 x 10 = 30	3 x 40 = 120

The Distributive Property

This property allows us to break apart factors. It can make computation more efficient. It will be used later in algebra.

In 8 x 6, we can break the 8 into (5 + 3). 8 x 6 becomes (5 x 6) + (3 x 6).

8 x 6
(5 x 6) + (3 x 6)
30 + 18
48

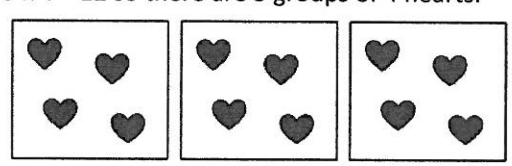


Division: Think Multiplication

Multiplication and division are related. When working with division, it sometimes makes sense to "think multiplication." 12 ÷ 4 could be thought of as "4 times what equals 12."

How many groups of 4 are in 12 hearts?
What is 12 ÷ 4?

What times 4 equals 12?
3 x 4 = 12 so there are 3 groups of 4 hearts.



Addition: Partial Sums

Many times it is easier to break apart addends. Often it makes sense to break them apart by their place value. Consider 248 + 345

248 = 200 + 40 + 8
345 = 300 + 40 + 5
500 + 80 + 13 = 593

Sometimes we might use partial sums in different ways to make an easier problem. Consider 484 + 276

484 = 400 + 84
276 = 260 + 16
660 + 100 = 760

Addition: Adjusting

We can adjust addends to make them easier to work with. We can adjust by giving a value from one addend to another.

Consider 326 + 274. We can take 1 from 326 and give it to 274.

	326	+	274	
	-1		+1	
More Friendly Problem →	325	+	275	= 600

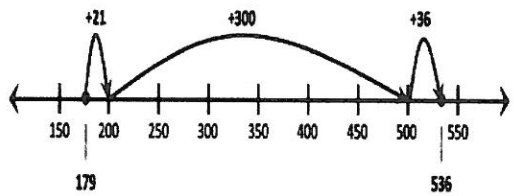
Consider 173 + 389. We can take 27 from 389 and give it to 173 to make 200.

	173	+	389	
	+ 27		-27	
More Friendly Problem →	200	+	362	= 562

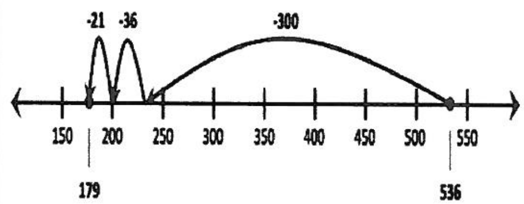
Subtraction: Count Up or Count Back

When subtracting, we can count back to find the difference of 2 numbers. In many situations, it is easier to count up.

Consider 536 – 179



We can count up from one number to the other. The difference is 300 + 21 + 36 or 357. (above)



We can count back from one number to the other. The difference is -300 (land at 236), -36 (land at 200) – 21 (end at 179).

Subtraction: Adjusting

We can use "friendlier numbers" to solve problems. 4,000 – 563 can be challenging to regroup. But the difference between these numbers is the same as the difference between 3,999 – 562. Now, we don't need to regroup.

(Original problem)	**4,000**	-	**563 =**
(Compensation)	- 1		- 1
	3,999	-	562 = 3,437

What Is Multiplication?

Multiplication has different representations based on the context. Regardless of the representation, the product of any 2 factors remains the same. Representations for 3rd grade include:

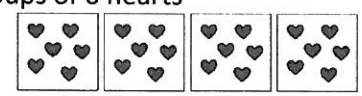
These examples are for 6 x 4.

Repeated Addition:

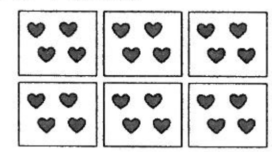
6 + 6 + 6 + 6
4 + 4 + 4 + 4 + 4 + 4

Equal Groups / Sets:

4 groups of 6 hearts



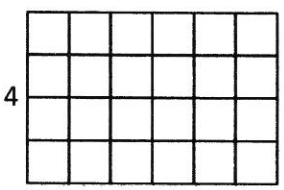
6 groups of 4 hearts



Area/Array Model:

6

4



6 x 4 = 24 square units -or-
4 x 6 = 24 square units

The Commutative Property

This property allows us to reverse the order of factors. It is useful in many situations.

Examples above show that 6 x 4 is equal to 4 x 6 regardless of the representation.

Algorithm: Partial Products

When do I use it?

- Students use this algorithm to find products of multiplication problems.

Description:

- Each factor is thought of as a sum of ones, tens, hundreds, and so on. Each part of one factor is multiplied by each part of the other factor.

Example:

Example 1

Multiply 6 x 43

Think of 43 as 4 tens and 3 ones.

Multiply each part of 43 by 6

6 ones x 4 tens:	6 x 40 = 240
6 ones x 3 ones:	6 x 3= 18

Add these two parts: 240 + 18 +258

6 x 43 = 258

Example 2

Multiply 25 x 37

Think of 25 as 2 tens and 5 ones
Think of 37 as 3 tens and 7 ones

Multiply each part of 25 by each part of 37

2 tens x 3 tens:	20 x 30= 600
2 tens x 7 ones:	20 x 7= 140
5 ones x 3 tens:	5 x 30 =150
5 ones x 7 ones	5 x 7=35

Add these four parts: 600+140 +150 +35 =925

25 x 37 = 925

Milestones:

- If students can give a ballpark estimate of the product and understands place value and the distributive property, they are ready to move on to the traditional algorithm.

2 x 1

_______ X _______ = _______

_______ X _______ = _______

_______ X _______ = _______

3×1

____ X ____ = ____

____ X ____ = ____

____ X ____ = ____

____ X ____ = ____

4 x 1

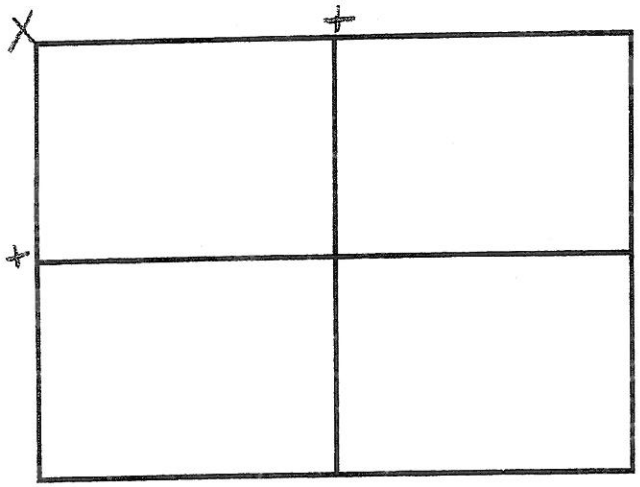
_______ X _______ = _______

_______ X _______ = _______

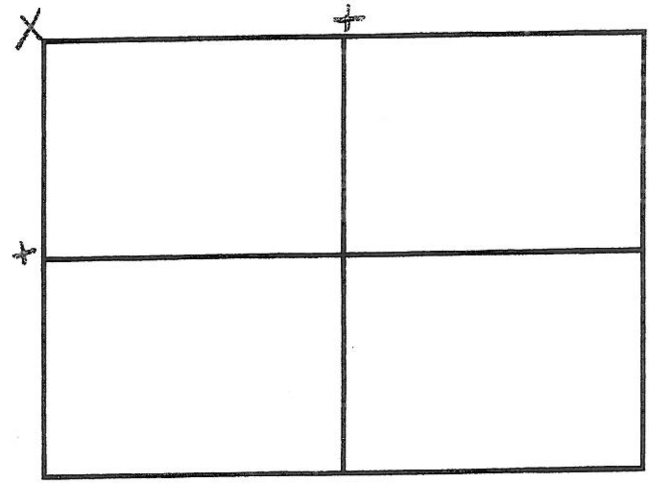
_______ X _______ = _______

_______ X _______ = _______

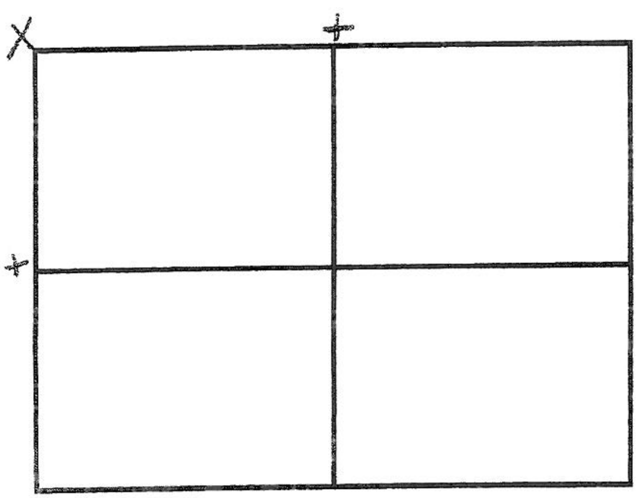
________ X ________ = ________



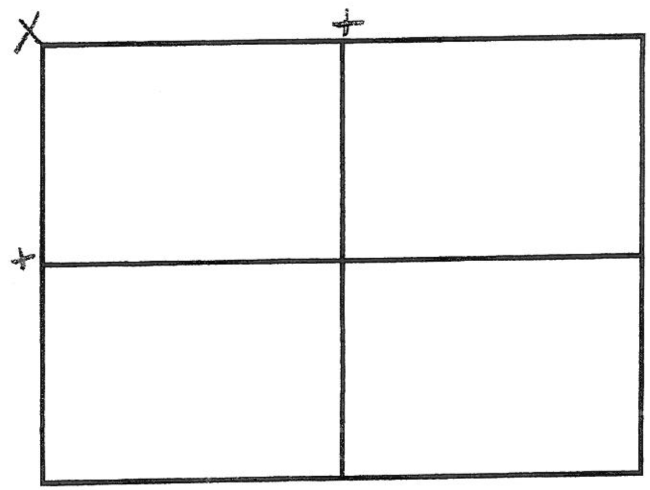
________ X ________ = ________



________ X ________ = ________



________ X ________ = ________



7 x 7

______ X ______ − ______ ______ X ______ − ______

x + +

\+

x + +

\+

______ X ______ = ______ ______ X ______ = ______

x + +

\+

x + +

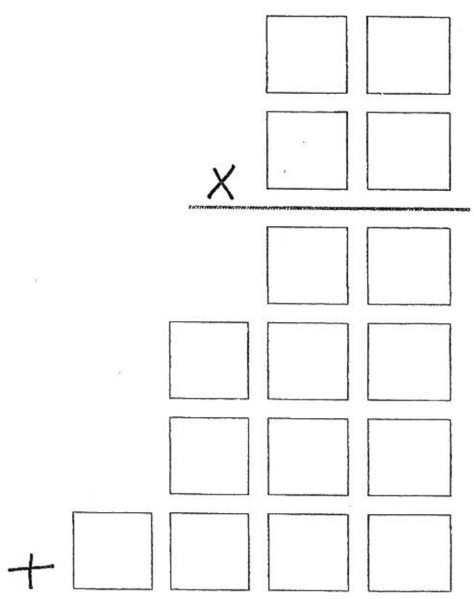
\+

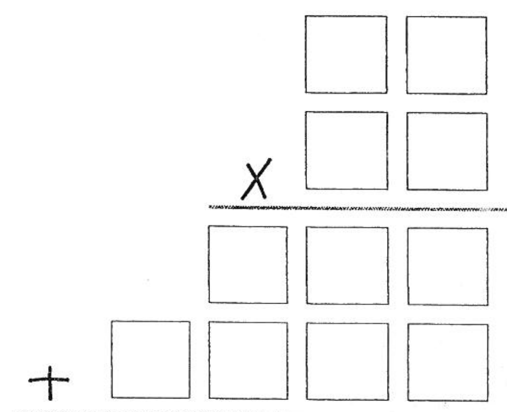
Still Partial Product but organized like the standard algorithm

		2	5	
×		2	3	
		1	5	(3×5)
		6	0	(3 × 20)
	1	0	0	(20 × 5)
+	4	0	0	(20 × 20)
	5	7	5	

Standard Algorithm

		1		
		2	5	
×		2	3	
		7	5	
+	5	0	⊗	
	5	7	5	





2 4 3
X 2 4

1 2 (4 x 3)
1
1 6 0 (4 x 40)
1
8 0 0 (4 x 200)
6 0 (20 x 3)
8 0 0 (20 x 40)
\+ 4 0 0 0 (20 x 200)

5, 8 3 2

X X
2 4 3
2 4
X
1
9 7 2
\+ 4 8 6 ⓧ

5, 8 3 2

X

\+

X

\+

3 x2

Dividing – Partial Quotients

Multiplication: Partial Products

Students move from area/array models (other side) to working with numbers.

Consider 26 x 45, we can break apart each factor by its place value.

26 = (20 + 6)
45 = (40 + 5)

We can then multiply each of the "parts" and add them back together.

```
(20 x 40) + (20 x 5) + (40 x 6) + (6 x 5)
   800    +   100    +   240    +   30
              900    +   240    +   30
                        1,140   +   30
                                  1,170
```

So, 26 x 45 = 1,170

It might seem like a lot of numbers above. But, when we think about it, the multiplication is quite simple. This understanding develops mental math, the traditional algorithm, and algebraic concepts including factoring polynomials.

Sometimes, it makes sense to work with different parts. Consider 51 x 21. We might think of 21 as 10 + 10 + 1:

```
(51 x 10) + (51 x 10) + (51 x 1)
   510    +    510    +     51
              1,020   +     51
                         1,071
```

So, 51 x 21 = 1,071

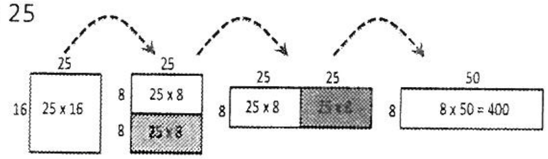
Another example, consider 4 x 327. We can break 327 into (300 + 20 + 7) then multiply.

```
   4 x 300 =  1,200
    4 x 20 =     80
+    4 x 7 =     28
              1,308
```

So, 4 x 327 = 1,308

Doubling and Halving

There are many strategies we can take advantage of so that computation is efficient. Doubling and halving is an example. When multiplying, we can double one factor and halve the other. The product is unchanged. This makes some numbers easier to work with. Consider 16 x 25



The image shows that we can halve 16 (8 + 8) and then double 25. So, 16 x 25 is the same as 8 x 50.

Division

4th grade students are beginning to develop an understanding of division with larger numbers. One approach is to take groups of numbers, usually "friendly numbers" out.

Consider this:
We have 252 buttons to put in 4 boxes. How many buttons can we put in each box? (252 ÷ 4)

```
We can put 50 in each box (4 x 50) = 200
We can put 10 in each box (4 x 10) =  40
We can put  3 in each box  (4 x 3) =  12
           63                        252
```

So, we can put 63 buttons in each box.
252 ÷ 4 = 63

Another approach is to break apart the dividend into "friendly numbers." Consider 252 ÷ 4. We could break 252 into (240 + 12) and divide each by 4.

240 ÷ 4 = 60 60 + 3 = 63
12 ÷ 4 = 3 So, 252 ÷ 4 = 63

Developing Computational Fluency

Grade 4

Elementary Mathematics Office
Howard County Public School System

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345 = 300 + 40 + 5
500 + 80 + 13 = 593

Sometimes we might use partial sums in different ways to make an easier problem. Consider 484 + 276

484 = 400 + 84
276 = 260 + 16
660 + 100 = 760

Addition: Adjusting

We can adjust addends to make them easier to work with. We can adjust by giving a value from one addend to another.

Consider 326 + 274. We can take 1 from 326 and give it to 274.

326 + 274
-1 +1
More Friendly Problem → 325 + 275 = 600

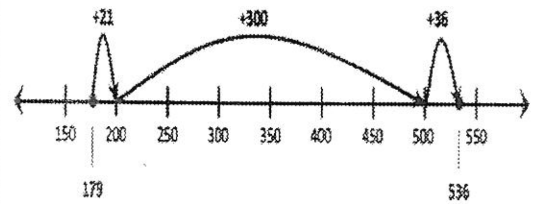
Consider 173 + 389. We can take 27 from 389 and give it to 173 to make 200.

173 + 389
+ 27 -27
More Friendly Problem → 200 + 362 = 562

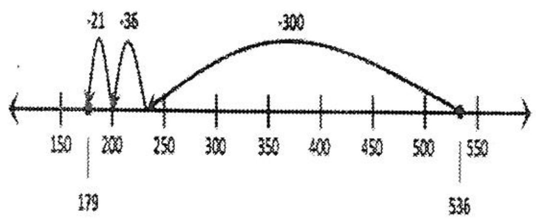
Subtraction: Count Up or Count Back

When subtracting, we can count back to find the difference of two numbers. In many situations, it is easier to count up.

Consider 536 – 179



We can count up from one number to the other. The difference is 300 + 21 + 36 or 357. (above)



We can count back from one number to the other. The difference is -300 (land at 236), -36 (land at 200), – 21 (end at 179).

Subtraction: Adjusting

We can use "friendlier numbers" to solve problems. 4,000 – 563 can be challenging to regroup. But the difference between these numbers is the same as the difference between 3,999 – 562. Now, we don't need to regroup.

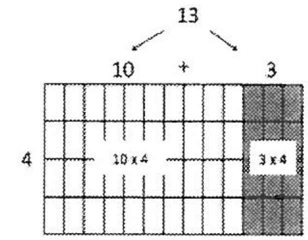
(Original problem) **4,000** - **563 =**
(Compensation) - 1 - 1

3,999 - 562 = 3,437

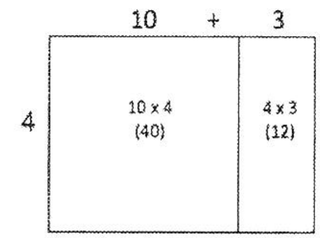
Multiplication: Area/Array

The area/array model for multiplication and the distributive property are used to solve multiplication problems

13 x 4 =
(10 x 4) + (3 x 4) =
40 + 12 =
52



This is the same model without grid lines. It is considered an "open model."



40 + 12 = 52

The open model also works well with 2 or 3-digit factors. This supports development of algorithms later, as well as mental mathematics. Consider 29 x 14

	20	+ 9
10	**200** (20 x 10)	**90** (9 x 10)
+ 4	**80** (20 x 4)	**36** (9 x 4)

200 + 90 + 80 + 36 = 406   So, 29 x 14 = 406

Multiplication: Multiples of 10

Understanding why we "add zeros."

3 x 6 = 18
3 x 6 tens = 18 tens
3 x 60 = 180

20 x 40 =
(2 x 10) x (4 x 10) =
2 x 4 x 10 x 10 =
8 x 100 = 800

Multiplication: Partial Products Algorithm

In this algorithm, we break apart the numbers by place value to find parts of the product. We add them back together to get the final product. This algorithm begins in the **ones** place.

```
   48
 x 32
   16  <----  (2 x 8)
   80  <----  (2 x 40)
  240  <----  (30 x 8)
+ 1200 <----  (30 x 40)
 1,536
```

Multiplication: Partial Products Algorithm

In this algorithm, we break apart the numbers by place value to find parts of the product. We add them back together to get the final product. This algorithm begins in the **tens** place.

```
   48
 x 32
 1200  <----  (40 x 30)
  240  <----  (30 x 8)
   80  <----  (40 x 2)
 + 16  <----  (8 x 2)
 1,536
```

Multiplication: Traditional Algorithm

This is a digit-based algorithm. It is useful for multiplying large numbers. We begin in the ones place and proceed to multiply each digit. We combine products of each place value.

```
    48
  x 32
    96 <----  (2 x 8) + (2 x 40)
+ 1440 <----  (30 x 8) + (30 x 40)
 1,536
```

Division*

5th grade students continue to develop an understanding of division with larger numbers. One approach is to take groups of numbers, usually "friendly numbers" out.

Consider this:

We have 252 buttons to put in 4 boxes. How many buttons can we put in each box? (252 ÷ 4)

```
We can put 50 in each box (4 x 50) = 200
We can put 10 in each box (4 x 10) =  40
We can put  3 in each box  (4 x 3) =  12
           63                         252
```

So, we can put 63 buttons in each box.

252 ÷ 4 = 63

Another approach is to break apart the dividend into "friendly numbers." Consider 252 ÷ 4. We could break 252 into (240 + 12) and divide each by 4.

240 ÷ 4 = 60   60 + 3 = 63

12 ÷ 4 = 3   So, 252 ÷ 4 = 63

We may also consider Think Multiplication to work with division. Consider 932 ÷ 45.

We can think of "What times 45 equals 932?"

We might think 45 x 10 = 450, so...

45 x 20 = 900

20 groups of 45 is 900. We have 32 leftover but that is not enough for another group.

932 ÷ 45 = 20 with 32 leftover.

* The long division algorithm is introduced in grade 6 after students develop deep understanding of grouping and division.

Developing Computational Fluency

Grade 5

Elementary Mathematics Office
Howard County Public School System

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More Friendly
Problem ---->    325  +  275    = 600
```

Consider 173 + 389. We can take 27 from 389 and give it to 173 to make 200.

```
                 173  +  389
                + 27     -27
                 ____________
More Friendly
Problem ---->    200  +  362    = 562
```

Addition: Traditional Algorithm

This algorithm is useful for adding large numbers. We add place values and regroup when needed.

```
   1 1
  13,089
+  4,684
________
  17,773
```

Subtraction: Count Up or Count Back

When subtracting, we can count back to find the difference of 2 numbers. In many situations, it is easier to count up. Consider 536 – 179.

Counting Up	Counting Back
179 + 21 = 200	**536** - 36 = 500
200 + 300 = 500	500 - 300 = 200
500 + 36 = **536**	200 - 21 = **179**
	(-) 357
The total of our **counting up** is 357.	The total of our **counting back** is 357.
So, 536 – 179 = 357	So, 536 – 179 = 357

Subtraction: Adjusting

We can use "friendlier numbers" to solve problems. 4,000 – 563 can be challenging to regroup. But the difference between these numbers is the same as the difference between 3,999 – 562. Now, we don't need to regroup.

```
(Original problem)  4,000   -   563 =
  (Compensation)      - 1        - 1
                    _____      _____
                    3,999   -   562 = 3,437
```

Subtraction: Traditional Algorithm

This algorithm is useful for subtracting large numbers. We regroup when necessary.

```
     8 1
  14,2̸90
-  3,236
________
  11,054
```

Multiplication: Partial Products

Students move from area/array models to working with numbers.

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```

So, 26 x 45 = 1,170

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Another example, consider 4 x 327. We can break 327 into (300 + 20 + 7) then multiply.

```
  4 x 300 =  1,200
   4 x 20 =     80
+   4 x 7 =     28
________________
             1,308
```

So, 4 x 327 = 1,308