Can computation models provide a pathway to computational fluency?

Sandy Atkins, Ph.D.
satkins@creatingahas.com
www.creatingahas.com

Algorithm Fluency

Standard Algorithm Fluency

Strategies

Algorithms

↑

Strategies

Conceptual Understandings

Number — Operations

Strategies ← **Algebraic Properties**

↓

Algorithms
including standard algorithms

52 – 29

52 – 29

Fifty-two minus twenty-nine.	**symbolic decoding**
Fifty-two subtract twenty-nine.	
Fifty-two take away twenty-nine.	**removal or take away**
Fifty-two remove twenty-nine.	
Fifty-two is how many more than twenty-nine?	**comparison**
How many more is fifty-two than twenty-nine?	
How many fewer is twenty-nine fifty-two?	

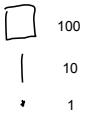
Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language

Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language
Subtraction	Removal or take away Comparison		Minus Subtract	remove take away more fewer

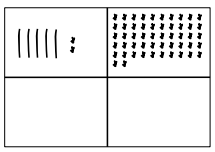
52 – 29

52

tens	ones
5	2
	52
3	22
4	12
2	32
1	42

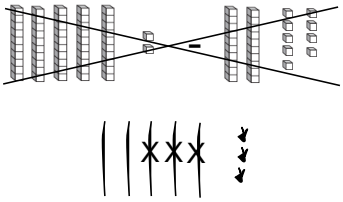


52



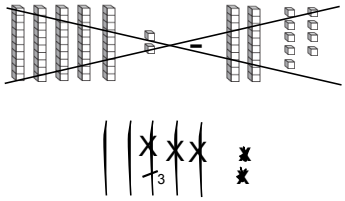
tens	ones
5	2
	52
3	22
4	12
2	32

52 – 29



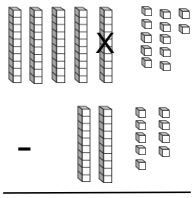
Creating AHAs

52 – 29

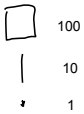


Creating AHAs

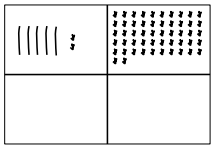
52 – 29



Creating AHAs



52



tens	ones
5	2
	52
3	22
4	12
2	32

Creating AHAs

$\overset{4}{\not{5}}\overset{1}{2}$
$-\ 29$

tens	ones
5	2
	52
3	22
4	**12**
2	32

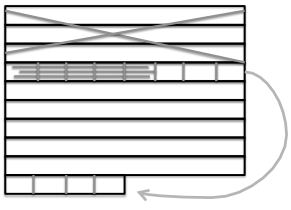
Creating AHAs

$\overset{4}{\not{5}}\overset{1}{2}$
$-\ 29$

$\overset{3}{4}\ \overset{1}{2}\frac{2}{5}$
$-2\ \frac{4}{5}$

Creating AHAs

$9\frac{1}{2} - 3\frac{5}{8} = 5\frac{7}{8}$



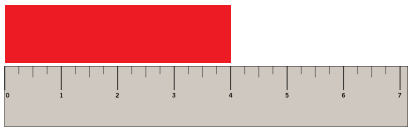
Creating AHAs

52 – 29

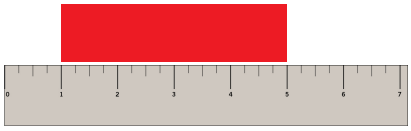
53 - 30

49 - 26

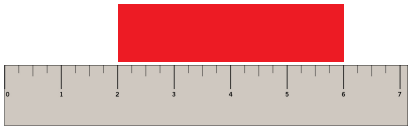
Creating AHAs



Creating AHAs



Creating AHAs



Creating AHAs

6 – 2 = 4

5 – 1 = 4

7 – 3 = 4

8 – 4 = 4

Creating AHAs

4 9
5 1 1
500
-326

Creating AHAs

500 − 326 → 499 − 325

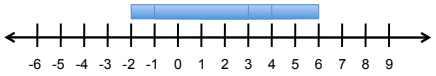
Creating AHAs

4127 − 1900 → 4227 − 2000

Creating AHAs

3.01 − 1.57 → 2.99 − 1.55

Creating AHAs

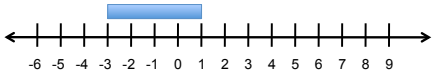


6 – 2 = 4
5 – 1 = 4
4 – 0 = 4
3 – -1 = 4
2 – -2 = 4

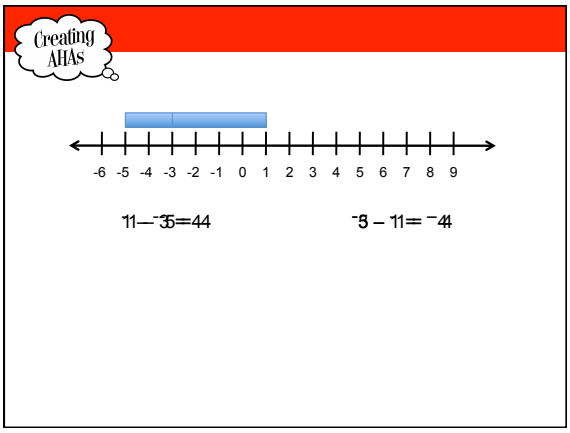
Creating AHAs

6 – 2 = 4 2 – 6 = ¯4

Creating AHAs



1 – ¯3 = 4 ¯3 – 1 = ¯4



Difference as Distance

(There are an infinite number of ways to make the same difference)

Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language
Subtraction	Removal or take away Comparison Difference as distance		Minus Subtract	remove take away more fewer

If Sammi purchased something from you that cost $27 and paid for it with a $50 bill, describe how you would count back her change. Represent on a number line.

Mrs. Gonzalez collects frogs (stuffed, figurines, funny ones). She got 5 new frogs for her birthday. Now she has 61 frogs. How many frogs did she have before her birthday? Write an equation.

$61 - 5 = x$

$x + 5 = 61$

Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language
Addition Multiplication Division				

Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language
Addition	Joining Put together Combine Part-part-total			

Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language
Multiplication	Equal groups Equal distances Arrays Area			

Operation	Concept/ Model	Symbols	Symbolic decoding	Conceptual language
Division	Partitioning • Know total •Know # of groups •Find # in each group Quotitioning •Know total •Know # in each group •Find # of groups		1 ½ ÷ ½ One and a half divided by one-half	How many halves in one and a half?

Conceptual Understandings

Number

Operations
Models

Computational Fluency

Creating AHAs

www.creatingahas.com
satkins@creatingahas.com

Mathematics Education Professional Development