Elementary Mathematics Professional Learning
Apprentissage professionnel en mathématiques à l'élémentaire

Making Additive Thinking Accessible to All

http://learning.arpdc.ab.ca

Additive Thinking

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Webinar Objectives

- Develop participants' understanding of Additive Thinking
- Explore a variety of additive strategies
- Provide strategies for supporting students

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Counting

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Counting

Students learn to count

- 1, 2, 3, 4, 5…
- 2, 4, 6, 8 …
- 5, 10, 15, 20 …
- 10, 20, 30, 40 …

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Counting

Then, they learn to count on from a known number

- Count from 5: 5, 6, 7, 8

Additive Thinking

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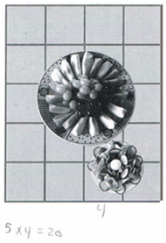
Multiplicative Thinking is…

A capacity to work flexibly with the concepts, strategies and representations of multiplication and division as they occur in a wide range of contexts.



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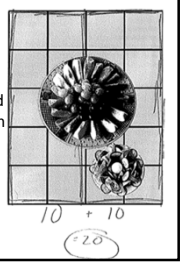
Additive Thinking

Students are able to manipulate numbers by **joining**, **separating**, and **comparing** while engaging in **flexible mathematical reasoning**. It is

- a capacity to work flexibly with the concepts, strategies and representations of addition and subtraction as they occur in a wide range of contexts. (mathematical reasoning)
- going beyond memorization of basic arithmetic skills
- the means to communicate additive understanding effectively in a variety of ways (for example, words, diagrams, symbolic expressions, and written algorithms).



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Additive Thinking
Big Idea 1

Additive Thinking

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Big Idea 1

Once students trust "the count", they can flexibly manipulate numbers in order to make solving problems easier by

- using Parts and Wholes
- decomposing / Recomposing
- partitioning
- compensating
- using Constant Difference

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Number Sense: Grade 1 N9

Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts, concretely, pictorially and symbolically, by:

- using familiar mathematical language to describe additive and subtractive actions
- creating and solving problems in context that involve addition and subtraction
- modeling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically.

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Big Idea 1

Once students trust "the count", they can flexibly manipulate numbers in order to make solving problems easier by

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- decomposing / Recomposing
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Additive Thinking

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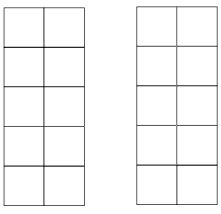
Ten Frames: 9 + 4

9 + 4



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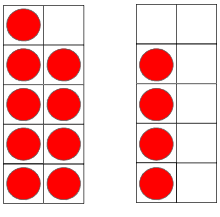
Ten Frames: 9 + 4

9 + 4



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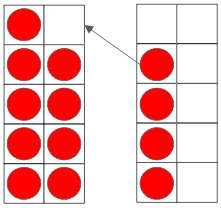
Ten Frames: 9 + 4

9 + 4



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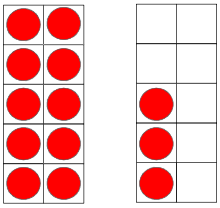
Ten Frames: 9 + 4

10 + 3



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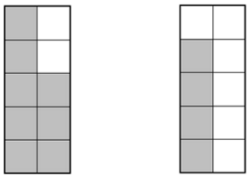
Ten Frames: 8 + 4



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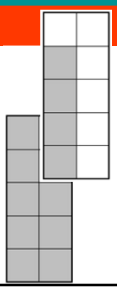
Ten Frames: 8 + 4

10 + 2

8 + 4 = 10 + 2



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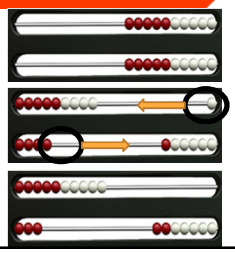
Math Rack: 9 + 4



9 + 4

10 + 3

9 + 4 = 10 + 3

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Number Sense: Grade 2 N9

Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:

- using personal strategies for adding and subtracting with and without the support of manipulatives
- creating and solving problems that involve addition and subtraction
- using the commutative property of addition (the order in which numbers are added does not affect the sum)
- using the associative property of addition (grouping a set of numbers in different ways does not affect the sum)
- explaining that the order in which numbers are subtracted may affect the difference.

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Math Rack: 28 + 36

28

36

60

4

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28 + 36

28 + 36

30 + 34

= 64

28 + 36

24 + 40

= 64

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Number Sense Grade 3 N9

Demonstrate an understanding of addition and subtraction of numbers with answers to 1000 (limited to 1-, 2- and 3-digit numerals), concretely, pictorially and symbolically, by:

- using personal strategies for adding and subtracting with and without the support of manipulatives
- creating and solving problems in context that involve addition and subtraction of numbers.

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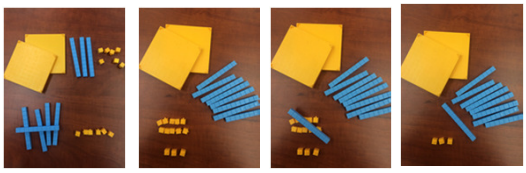
Base Ten Blocks



237 + 56 | 2 hundreds 8 tens 13 ones | exchange 10 ones for 1 ten | = 293

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Number Sense Grade 4 and 5 N11

Demonstrate an understanding of addition and subtraction of decimals

- Grade 4: limited to hundredths
- Grade 5: limited to thousandths

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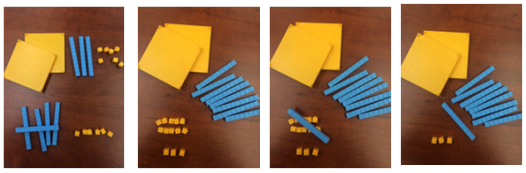
Base Ten Blocks



2.37 + 0.56 | 2 ones 8 tenths 13 hundredths | exchange 10 hundredths for 1 tenth | = 2.93

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Automaticity vs Memorization

When relationships are the focus, there are far fewer facts to remember.

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Additive Thinking
Big Idea 3

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Big Idea 3

Addition is not just adding. It's subtraction as well as it deals with questions where the start, change or result is unknown. It is joining, separating and comparing.

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Open Number Lines

Students keep track of jump sizes, landing spots and total distance moved.

Find 2 ways to get from the red number to the black number.

120 390

2 614 3 315

26 467 You choose . . . 37 212

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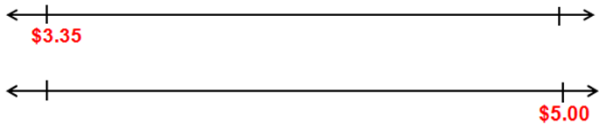
Open Number Lines

John buys a treat for $3.35. He gave the clerk $5.00. How much change does he receive?



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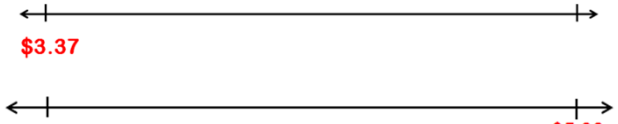
Open Number Lines - Numeracy

John buys a treat for $3.37. He gave the clerk $5.00. How much change does he receive?



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Question Types

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Combine (P - P - W)

Whole unknown: Sally has $15 in bills and $5 in coins. How much does she have altogether?

Part unknown: Sally has $32. $15 are in bills and the rest is in coins. How much is in coin?

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Change (Join)

Result unknown: Sally has $35.25. She earns $58.85. How much does she has at the end of the day?

Start unknown: Sally has a few dollars. John has $7. Together they have $13. How much does Sally have?

Change unknown: Sally has $28. How much more money does she need to save if she wants to buy a $37 game?

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Change (Separate)

Result unknown: Sally has $57. She gives $32 to pay her mother back. How much money does she have left?

Start unknown: Sally has some money in her wallet. She spends $15 at the store. She has $41 left. How much money did she start with?

Change unknown: Sally has $28. She buys a gift. She is left with $20. How much was the gift?

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Compare

Compare Quantity unknown (Type 1): Sally has $75. She has $30 more than John. How much money does John have?

Compare Quantity unknown (Type 2): Sally has $42. John has $15 more than Sally. How much money does John have?

Difference unknown: Sally has $5.25. John has $3.90. How much more does Sally have than John?

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Do Not Forget…

Give your students a wide variety of questions so they can practice a wide variety of strategies.

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Additive Thinking Student Examples

Additive Thinking

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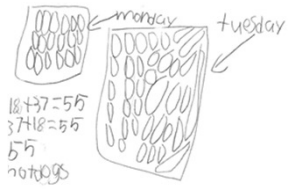
The Case of the Hotdogs

On Monday, 18 hotdogs were ordered for Friday's fundraiser. On Tuesday, 37 hotdogs were ordered for Friday's fundraiser. How many hotdogs were ordered on Monday and Tuesday? Show how you got the answer.



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Quick Assessment

Quick Assessment

The Answer	☐ Is Correct ☐ Obvious ☐ Inferred slightly ☐ Inferred majorly		☐ Is Incorrect ☐ Has a minor mistake ☐ Has a misunderstanding
The Strategy is a(n)	☐ Counting Strategy ☐ Counting ☐ Counting on/back	☐ Additive Thinking Strategy ☐ Making 10 ☐ Using doubles (3+3) ☐ Part-Part-Whole	☐ Multiplicative Thinking Strategy ☐ Using Doubles (3x2) ☐ Arrays ☐ Part-Part-Whole ☐ Known Facts
	☐ Other		
Notes/Next Steps	Follow up Questions to Ask the Student Follow up Steps for Student		

Additive Thinking

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Quick Assessment

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Additive Thinking

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Quick Assessment

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	☐ Other		

Additive Thinking

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Quick Assessment

Notes/Next Steps	Follow up Questions to Ask the Student Follow up Steps for Student

Additive Thinking

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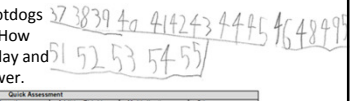

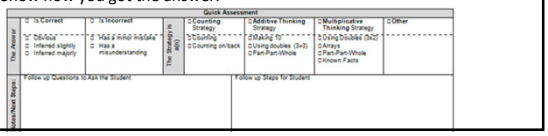

Additive Thinking

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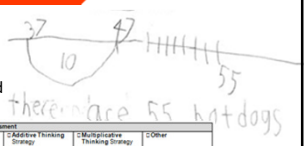

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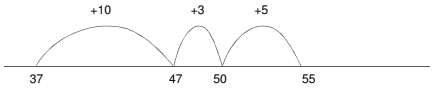
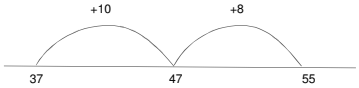
Next Steps





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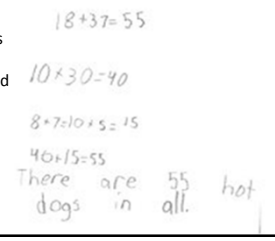

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The Case of the Hotdogs: 18 + 37

$$\begin{array}{r} 18 \\ +37 \\ \hline 15 \\ +40 \\ \hline 55 \end{array}$$

$$18 \xrightarrow{+2} 20 \qquad +37 \xrightarrow{-2} +35 \qquad 55$$

$$\begin{array}{r} {\scriptstyle 1} \\ 18 \\ +37 \\ \hline 55 \end{array}$$

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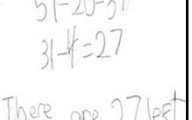
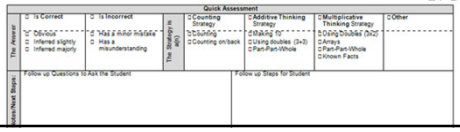
The Easter Egg Hunt

The teacher sets up a class Easter Egg hunt and hid 51 Easter eggs. Students found 24 Easter eggs. How many are left to find?





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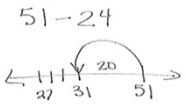
The Easter Egg Hunt

The teacher sets up a class Easter Egg hunt and hid 51 Easter eggs. Students found 24 Easter eggs. How many are left to find?

51 − 24



I counted back from fifty-one to twenty seven on the number line.

Quick Assessment

The Answer	Is Correct	Is Incorrect	The Strategy is Based On	Counting Strategy	Additive Thinking Strategy	Multiplicative Thinking Strategy
	Inferred slightly Inferred majority	Has a misunderstanding		Counting on/back	Using doubles (3+3) Part-Part-Whole	Arrays Part-Part-Whole Known Facts

Follow up Questions to Ask the Student

Follow up Steps for Student

Additive Thinking

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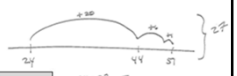
The Easter Egg Hunt

The teacher sets up a class Easter Egg hunt and hid 51 Easter eggs. Students found 24 Easter eggs. How many are left to find?

24 + ? = 51



So 24+27=51

Quick Assessment

The Answer	Is Correct	Is Incorrect	The Strategy is Based On	Counting Strategy	Additive Thinking Strategy	Multiplicative Thinking Strategy	Other
	Inferred slightly Inferred majority	Has a misunderstanding		Counting on/back	Using doubles (3+3) Part-Part-Whole	Arrays Part-Part-Whole Known Facts	

Follow up Questions to Ask the Student

Follow up Steps for Student

Additive Thinking

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Going Further

How would you respond if you saw a student do this?

431
-275
200
- 40
- 4
160−4
=156

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Additive Thinking Learning Guide

http://learning.arpdc.ab.ca

Learning Portal

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Courses that require a login are indicated in the top menu with an asterisk (*).
For steps on how to create an account on the ARPDC Learning Portal, please click here.

Welcome to the ARPDC Learning Portal

You will find a variety of resources, strategies and ideas all based in the Alberta Education context.

To facilitate access to additional PD resources, educators are invited to explore the links available by clicking on the image below:

Adobe Connect Tutorials

Elementary Mathematics Professional Learning
Equality Webinar
English: November 2, 2015 at 1:00pm or 4:30pm
French: November 3, 2015 at 1:00pm or 4:00pm

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EMPL Website Tour

http://learning.arpdc.ab.ca

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EMPL Opportunities

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Upcoming Webinars

Making Multiplicative Thinking Accessible to All
January 18, 2016
- 1 pm - 2 pm
- 4 pm - 5 pm

Assessment
February 22, 2016
- 1 pm - 2 pm
- 4 pm - 5 pm

Elementary Math Professional Learning Opportunity
Register at: http://arpdc.ab.ca

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ARPDC

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