Operations

Algorithm

- Explain the standard algorithm for addition.

Other algorithms

Intermediate algorithm #1		Intermediate algorithm #2	Standard algorithm
268		268	1
+ 633		+ 633	268
---------		---------	+ 633
11	sum of ones	11	---------
90	sum of tens	9	901
800	sum of hundreds	8	
---------		---------	
901		901	

Explain why each of these algorithms works.

Lattice algorithm

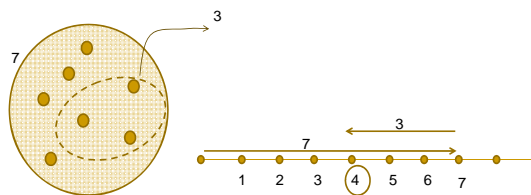| 2	5	8
6	3	3
8 / 0	8 / 1	1
8	9	1

Subtraction

- What is subtraction?

- How can you introduce subtraction to a child?

Take away approach

- If I have 7 candy and I give three to Crystal, how many candy do I have left?
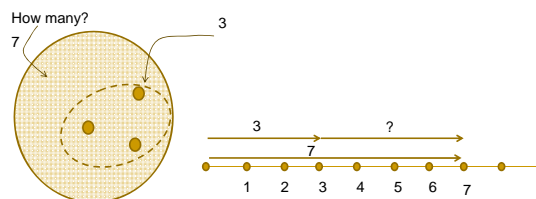

Definition – take away approach

- Let a and b any two whole numbers, and A and B sets such that n(A)=a and n(B)=b, and B ⊆ A. Then

$$a - b = n(A\backslash B)$$

- a – b is called the *difference* of a and b

Missing addend approach

- I have a box of chocolates that will fit 7, but there are only three inside. How many more do I need to fill the box?

Definition – missing addend approach

- Let a and b be any whole numbers. Then a-b=c if and only if a =b+c.

- c is called the *missing addend.*

Exercises

- What can you say about 3-5 under either approach to subtraction?

- Which approach can you use in the following problem: "If Maria has 7 books in her book bag, and Arielle has 4, how many more books does Maria have?"

Comparison approach

- If Maria has 7 books in her book bag, and Arielle has 4, how many more books does Maria have?

Maria

Arielle
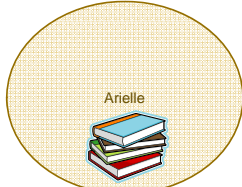
Properties

- Is there an identity element for subtraction?

- Is subtraction
  - commutative?
  - associative?

Teaching subtraction

- Up to 20 it follows from our 10 by 10 table

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

Four fact families:

3+8=11
8+3=11
11-3=8
11-8=3

Subtracting multidigit numbers

- Use one of the models to find:
  - 58-32

  - 52-38

Subtraction algorithm

- Explain the standard algorithm for subtraction.

- Subtract from the base algorithm