What to bring to class:
Ask students to bring PM 4A and 5A.

3.1 & 3.2 – Add/Subtraction Algorithm

3.1 – Addition Algorithm:

Def: An algorithm is a systematic, step-by-step procedure to solve a class of problems.

Ex: spell check, Addition Algorithm

Algorithms taught because:

* Always work– builds confidence
* become automatic– frees up memory
* completes topic & establishes "level playing field"

say: everyone in the class can +, – , x , ÷

Prerequisites to addition algorithm:

1) count to 1000
2) 1-digit add facts
3) 2-digit mental math
4) Expanded form via chip models
   a) Add w/ in same denomination
   b) Rebundling "10 dimes = 1 dollar"

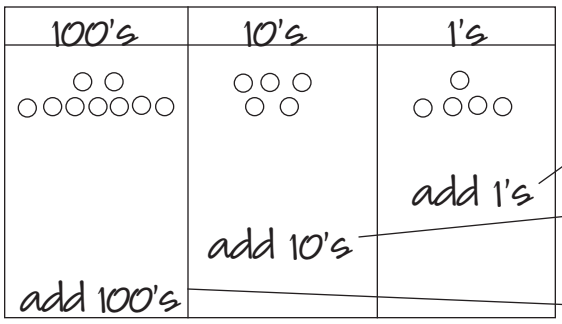
Teaching Stages:

1) No rebundling – simple idea: add ones, tens, hundreds separately.
   (say: no step (ii) of place value process)

* be sure to do chip model & #'s at the same time! Make connection between model & abstract!

Ex:

Add 231 + 724



Quickly move

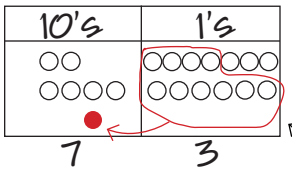
Concrete ⟹ Pictorial ⟹ Abstract

coins, etc chip model numbers only

2) Rebundling

a) 10 ones = 1 tens EX:

$$\begin{array}{r} {\scriptstyle 1} \\ 27 \\ +\ 46 \\ \hline 73 \end{array}$$



Call this "rebundling a ten"

b) 10 tens = 1 hundred

EX:

$$\begin{array}{r} 283 \\ +\ 142 \\ \hline \end{array}$$

c) combinations

EX:

$$\begin{array}{r} 295 \\ +\ 326 \\ \hline \end{array}$$

Have students try:

$$\begin{array}{r} 7065 \\ +3836 \\ \hline \end{array}$$

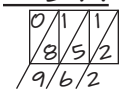
3) Alternative Algorithm: LATTICE METHOD

note: works only when place-value process known before hand

otherwise memorization w/o understanding

EX:

$$\begin{array}{r} 568 \\ +\ 394 \\ \hline \end{array}$$



Try:

$$\begin{array}{r} 3576 \\ +\ 4829 \\ \hline \end{array}$$

say: ① Chip models used briefly to introduce algorithm. Then only numbers

② Don't draw chip models on HW unless specifically asked.

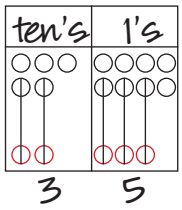
3.2 Subtraction Algorithm: (done similar to addition)

Teaching Stages:

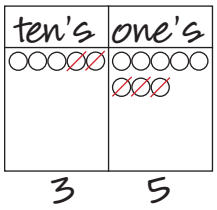
1) No rebundling (subtract ones, tens, etc)

Ex:
$$\begin{array}{r} 58 \\ -\ 23 \\ \hline 35 \end{array}$$

Comparison:



Take-away:

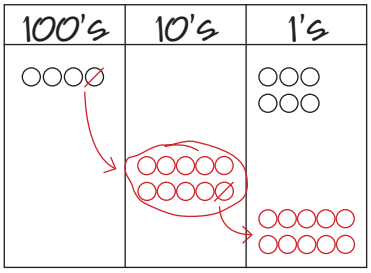


2) Rebundling: (decomposing a ten, splitting a bundle, etc)

10 ⟶ ○○○○○ ○○○○○

Hardest case:

Ex:
$$\begin{array}{r} 3\,9\,16 \\ \not{4}\,\not{0}\,\not{6} \\ -\ 1\,3\,9 \\ \hline \end{array}$$



Teaching Remark: Don't let student invent their own algorithms

1) Mental Math is for creativity
2) Hard on teacher
3) Algorithm is the structured conclusion.

Practice algorithms with word problems

Ex: Mr. Smith earned $3,265. His wife earned $2,955.
How much more money did he earn than his wife?
(individual – 2 minutes)

Teacher's Solution

$$\begin{array}{r} {}^{2}\cancel{3}\,{}^{1}2\,{}^{1}6\,5 \\ -\,2\,9\,5\,5 \\ \hline 3\,1\,0 \end{array}$$

He earned $310 more.

Alternate Algorithm: "Subtract from 10"

Ex:
$$\begin{array}{r} 2\,10 \\ \cancel{3}\,7 \\ -\,1\,9 \\ \hline 1\,8 \end{array}$$
← think: (10 – 9) + 7
(10 – 9) = ten's complement

Try:
$$\begin{array}{r} 61 \\ -\,37 \\ \hline \end{array} \qquad \begin{array}{r} 272 \\ -\,138 \\ \hline \end{array}$$

Adv: only need 10's complements
Dis: not standard, must add too!

Common Error:

$$\begin{array}{r} 45 \\ -\,7 \\ \hline 42 \end{array}$$

What's the mistake?
① "7 – 5" instead "15 – 7"
② "7+5" w/no rebundling

HW Read 3.1 & 3.2
HW 10 & 11