PUSHING FOR PROGRESSION

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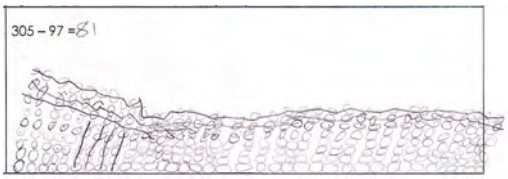
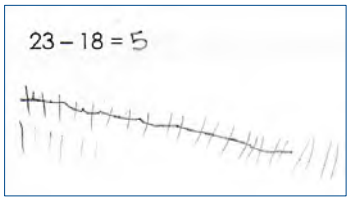
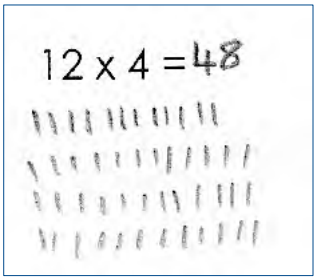
SA NUMERACY CHAIR PROJECT

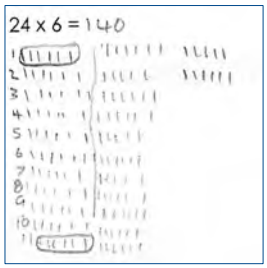
Eastern Cape region AMESA The Association for Mathematics Education of South Africa

Do these workings look familiar?

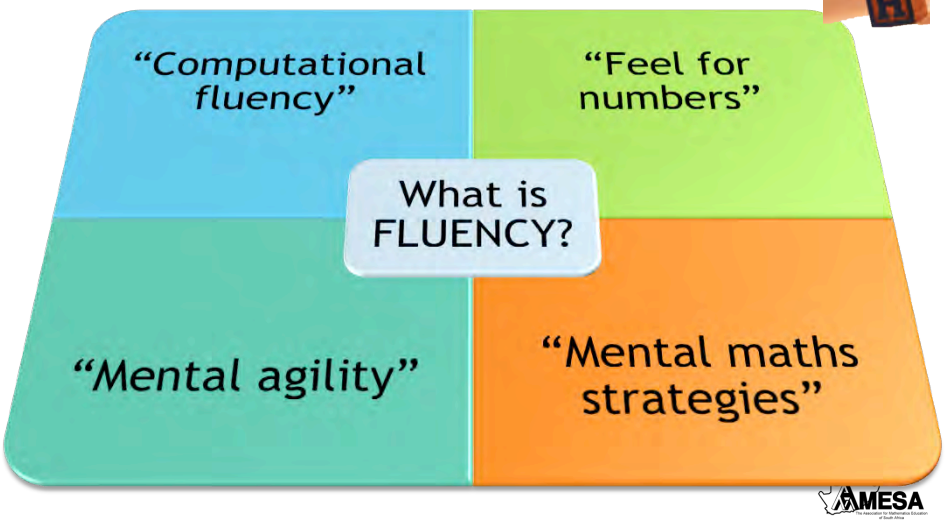








Basic building blocks for grades 1,2,3 & 4



Promoting fluency and progression: What are we aiming for?

NOT pure RECALL, ROTE memorisation, or use of algorithms

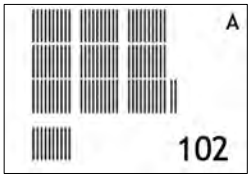
FLUENCY with UNDERSTANDING

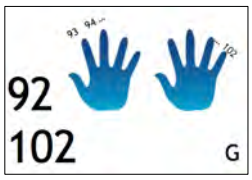
However, want some of these to become:
Habituated
Automated
Recall of facts

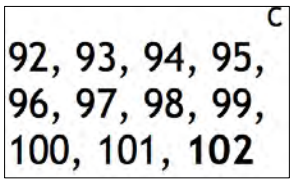
What should be automatic?
- Askew's 'basic facts'

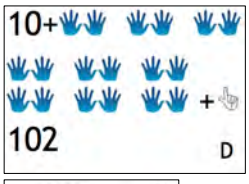
- adding or subtracting a single digit number to any number
- counting on or back in 1s from any starting number
- counting on or back in 2s, 10s, or 5s from any starting number
- adding a multiple of 10 or 100 to any number
- Doubling or halving any number
- knowing what to add to a number to make it up to a multiple of 10 or 100
- Multiplying any number by 10
- multiplying any number by 5 (by multiplying by 10 and halving)

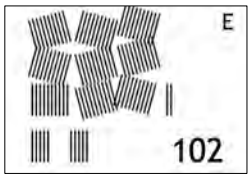
Askew, M. (2012). *Transforming Primary Mathematics*. Abingdon: Routledge.

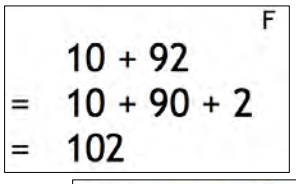


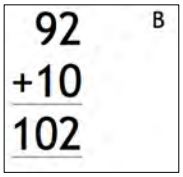








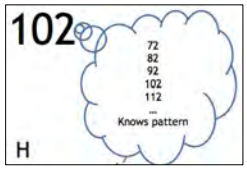




Add 10 to 92

These cards show the types of answers we have received from learners

Where would you put these along this spectrum?



SPECTRUM: used to classify something, in terms of its position on a scale between two extreme or opposite points

Concrete
Slow
inefficient

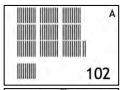
Efficient
Flexible
Habituated (where appropriate)

add 10 to 92
Methods on the spectrum

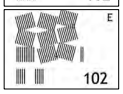
Concrete
Slow
Inefficient

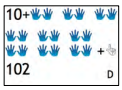
Efficient
Flexible
Habituated (where appropriate)

A



E

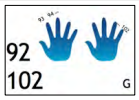




D

B

92
+10
102



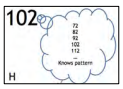
G

C

92, 93, 94, 95,
96, 97, 98, 99,
100, 101, **102**

F

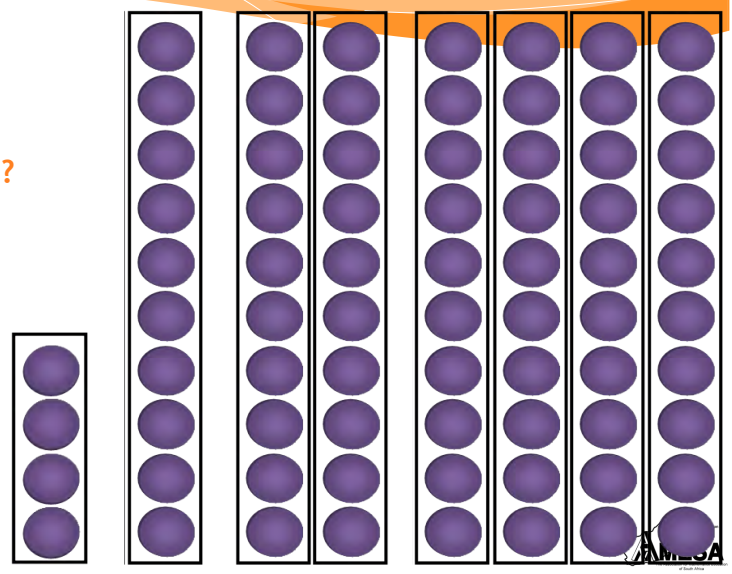
10 + 92
= 10 + 90 + 2
= 102



H

Another example: incrementing tens

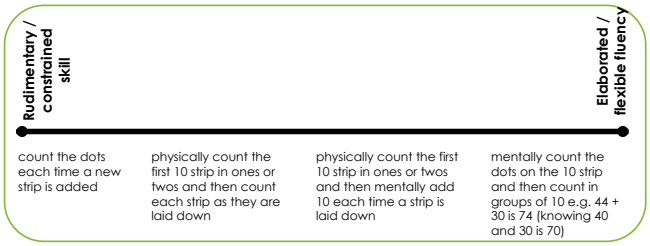
How many
can you see?



Learner responses to the question

- **Less efficient**:
  count the dots each time a new strip is added including the 4 dot strip
- **Slightly more efficient**:
  count the first 10 strip in ones or twos and then count by touching each strip (in tens) as they are laid down
- **Slightly more efficient**:
  count the first 10 strip in ones or twos and then mentally add 10 each time a strip is laid down.
- **More efficient method**:
  mentally count the dots on 4 and the 10 strip and then count on in groups of 10 e.g. 44 + 30 is 74 (knowing 40 and 30 is 70)

SPECTRUM FOR incrementing 10s



- some learners counted in ones from the beginning to get 74, accurately & correctly
- To say they have no procedural fluency would do no justice to fact that they performed the skill of counting in ones accurately.
- But to say the basic skill of one-to-one counting is fluency is problematic

Spectrums for multiplicative reasoning[1]

TASKS INVOLVING EQUAL GROUPS OF VISIBLE ITEMS OR ITEMS IN ARRAYS

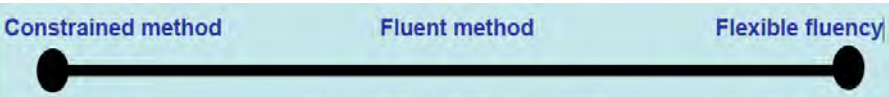
Solve the task count one by one (I)	Solve the task counting by one and some counting by multiples (IE)	Solve the task by counting using multiples of 3's, 4's and 5's(E)

FORMING EQUAL GROUPS

Counting by ones and confirm the number in groups by counting in ones (I)	Counting in ones and confirm and confirm counting in groups (IE)	Counting in groups and confirms in group counting (E)

ADVANCED MULTIPLICATION AND DIVISION TASKS WITHOUT VISIBLE ITEMS

Exhibit knowledge of composite units (I)	Exhibit knowledge of communicative principle of multiplication (IE)	Exhibit knowledge of inverse relationship between multiplication and division and multiplication facts to derive division facts (E)



Inefficient (I) — Somewhere in between (IE) — Efficient (E)

Mofu, 2013

In your classroom:

- Many learners 'trapped' in concrete one to one counting or dependence on algorithms without understanding
  - the result is an absence of flexibility and fluency with operations
- Encourage you to assess your own learners work in terms of a spectrum of fluency
- Design your own spectrums
- Develop fluency with Number Talks

During number talks, learners are asked to communicate their thinking when presenting and justifying solutions to problems they solve mentally. These exchanges lead to the development of more accurate, efficient, and flexible strategies.

The heart of number talks is classroom conversations focused on making sense of mathematics

- CLARIFY thinking
- INVESTIGATE and apply mathematical relationships
- Build a REPERTOIRE of efficient strategies
- Make decisions about choosing EFFICIENT strategies for specific problems
- Consider and TEST other strategies to see if they are mathematically logical

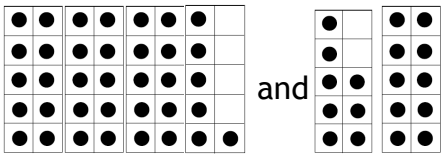
Why number talks?

Key Components of the talk

* Classroom environment and community
  * Safe, comfortable, accepting
  * Teacher practices "blank face"
* Classroom discussions
  * Use of hand signals
  * All answers - correct and incorrect - are recorded
* The teacher's role
  * Move into roles of facilitator, questioner, listener, and learner
  * Change question from, "What answer did you get?" to "How did you solve this problem?"
* Role of mental maths
  * When students approach problems without paper and pencil, they are encouraged to rely on what they know and understand about the numbers and how they are interrelated.
* Purposeful computation problems
  * Crafting problems that guide students to focus on mathematical relationships
  * Carefully planning is necessary
* More information and resources about Number Talks: http://www.ru.ac.za/sanc/nicle/nicle2014/nicle1-14/

Examples: aim - shift 1-1 counting strategies towards flexible fluency

* How many dots do you see? How did you get that?



* Calculate 12 x 7 – how did you get it?

- Opportunities for focusing on efficiency and explicitly promoting more efficient methods
- Opportunities for developing learner talk and learner fluency and mental flexibility
- Gesturing – show me! (pace)