# DON'T JUST ADD THE ZEROY

East Sheen Primary School Parents' Evening: Mastering Mathematics

#### Aims of this evening

- To develop an understanding of what a mastery approach is
- To develop an understanding of how mathematics is taught at ESPS
- To give you the tools and language to support your child's mathematics in the home

#### What is mastery in mathematics?

#### Become fluent

#### Reason mathematically

#### Can solve problems

#### Mathematical knowledge:

- Declarative knowledge facts, formulae, concepts, principles and rules I know that...
- 2. Procedural knowledge sequence of steps, methods, algorithms and procedures I know how...
- 3. Conditional knowledge ability to reason and problem solve. Declarative and procedural knowledge are transformed into strategies - I know when...



#### Declarative knowledge

I know that...



DB Crawford, 'Mastering maths facts: research and results', Otter Creek Institute, 2003.

There are 17 biscuits in a packet and 3 packets in a box. A supermarket orders 15 379 boxes. How many biscuits will be in the 15 379 boxes?

- times tables
- adding number bonds, bridging, place value
- Vocabulary

- Conversions of measure
- X by 1000
- times tables
- Adding number bonds, bridging, place value
- Subtraction
- Vocabulary

There are 28 pupils in a class. The teacher has 8 litres of orange juice. He pours 225 millilitres of orange juice for every pupil. How much juice is left?

## What declarative knowledge is needed to answer these multistep word problems?

### What are the implications?



Trap 2: beware cognitive load

- WM plays an essential role in children's mathematical learning (De Smedt et al., 2009).
- ► WM is a system with limited capacity.
- Processing or actively maintaining too much information in the WM can lead to cognitive overload.



#### How can you help build declarative knowledge?

- Develop mental strategies and skills
- Make reasoning and problem solving more accessible
- A retrieval tool

	Aut I	Aut 2	Spr I	Spr 2	Sum I	Sum 2
Reception	I can count forwards and backwards to 10 (20)	I can say one more and one less than a number	I know addition number bonds to 10	I know addition and subtraction bonds to 10	I know doubles to 10	I know halves to 10
Year I	I know number bonds to 10	I know fact families to 10	I know number bonds to 20	I can count Forwards and backwards to 50 from any given number.	I know doubles and halves of numbers to 10.	I can count in 2s, 5s and 10s
Year 2	I know number bonds to 20	I know number bonds to 100 (e.g. 30 + 70)	I can recall doubles and halves to 20	I can recall multiplication and division facts for the 2 and 10 x tables.	I can recall multiplication and division facts for the 5 x tables.	I can tell the time - to five minutes, including quarter past/to the hour
Year 3	I know all number bonds to 20 and can use number bonds to derive pairs of numbers that total 100 e.g. 64 + 36 = 100	I know multiplication and division facts for the 2,5 and 10 x tables	I know the multiplication and division facts for the 3 times tables	I know multiplication and division facts for the 4 times tables	I know multiplication and division facts for the 8 times tables	I can tell the time to the nearest minute (analogue & digital) on 12 and 24 hour clocks
Year 4	I can find out what must be added to any 2-digit number to make 100.	I know the multiplication and division facts for the 3, 6 and9 times tables	I know the multiplication and division facts for the 7and II times tables.	I know the multiplication and division facts for the II and I2 times table.	I can recognise decimal equivalents of fractions.	I can multiply and divide single-digit numbers by 10 and 100.
Year 5	I know the multiplication and division facts for all times tables up to I2 × I2.	I can count forwards or backwards in steps of powers of 10 (e.g. 100,10,000 etc) for any given number up to 1,000,000	I know all pairs of factors of numbers up to 100 and can identify prime numbers up to 19.	I know the decimal and percentage equivalents of the fractions ½, ¼, ¾, ⅓, ⅔, tenths and fifths	I know decimal number bonds to I and IO.	I know all squared numbers up to 12 x 12
Year 6	I know the multiplication and division facts for all times tables up to	I can multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3dp	I can derive multiplication and division facts using decimal numbers	I know all previous number bonds including decimals	I know the decimal and percentage equivalents of the fractions <sup>1</sup> / <sub>2</sub> , <sup>1</sup> / <sub>4</sub> , <sup>3</sup> / <sub>4</sub> , <sup>1</sup> / <sub>3</sub> ,	I can identify the properties of 3D shapes

KEY INSTANT RECALL FACTS (KIRFS)

# How can you practise the KIRFs at home?

- > Go onto the school website
- > Curriculum
- > Mathematics
- > KIRF handbook
- > Or Year Group pages
- > KIRF handbook

https://www.eastsheen.richmond.sch.uk/attachments/d ownload.asp?file=11076&type=pdf

#### RECEPTION

	Aut I	Aut 2	Spr I	Spr 2	Sum I	Sum 2
Reception	I can count forwards and backwards to 10 (20)	I can say one more and one less than a number	I know addition number bonds to 10	I know addition and subtraction bonds to 10	I know doubles to 10	I know halves to 10







# How will this impact on children's mental agility?

See links between concepts

Change both numbers while preserving the result, then add/subtract.

e.g. 49 + 17 = 66 49 + 17 is the same as 50 + 16 = 66

24 + 19	48 + 9	35 + 18
(24 + 20 – 1)	(48 + 10 – 1)	(35 + 20 – 2)

#### Example

If a child knows that 6 x 3 = 18, they can use this fact to solve related problems such as:

12 x 3	18 ÷ 3
0.6 x 3	180 ÷ 3



#### **Conditional knowledge**

I know when...

#### **Reasoning and problem solving**







#### CPA approach



### Concrete is the 'doing' stage

Use practical activities using manipultives including cubes and Numicon to demonstrate doubling







### Pictorial is the 'seeing' stage

Children draw representations of Dienes and cross off.







Draw dots and group them to divide an amount and clearly show a remainder.



Use bar models to show division with remainders.



### Abstract is the 'symbolic' stage



Insert zeros for place holders.



2digit divided by 1 digit, no remainder



#### Demonstration of CPA -Calculations policy







https://www.eastsheen.richmond.sch.uk/attachments/download.asp?file=8794&type=pdf

#### **Demonstration of CPA** -**Calculations policy**

Mo and Kim have some frogs.



Kim has 4 times as many frogs as Mo. They have 30 frogs in total.

How many frogs does Kim have?





 $\frac{3}{4}$  of  $\frac{1}{2}$  of Dexter's number is 21 What is Dexter's number?

5 lollipops cost the same as 2 chew

bars.



A lollipop costs 4p.

How much does a chew bar cost?







https://www.eastsheen.richmond.sch.uk/attachments/download.asp?file=8794&type=pdf

#### Language and precision

## Examples of misconceptions:

- Multiplying and dividing by 10 - You don't just add or take the zero
- Rounding you don't "just add one more"
- Place Value decimal place doesn't move
- Negative number not minus

#### https://www.eastsheen.richmond.sch. attachments/download.asp?file=9925 pe=pdf

YEAR 2: new words. Red words are not statutory but are desirable.

Number and	Fractions	Measurement	Geometry	Statistics
Calculation				
Calculation   digit   numeral   (twenty-one   twenty-two   twenty-three   twenty-four   (and so on up to)   ninety-nine   one hundred   multiple   commutative   place value   step counting   > as 'greater than'   < as 'less than'	third (one) (two) third(s) sharing grouping two quarters equivalent one and a quarter' one and 2 quarters one and 2 quarters half as much twice as much numerator denominator fraction bar/ vinculum	TIME analogue five/ten/ 1/4 past/to clockwise anticlockwise MASS gram kilogram LENGTH height width metre centimetre millimetre CAPACITY/ VOLUME litre millilitre TEMPERATURE degrees celcius thermometer MONEY price cost amount	SHAPE PROPERTIES vertical horizontal vertices edges faces quadrilateral polygon prism cone symmetry POSITION AND DIRECTION Straight curved rotate rotation angle right angle	pictogram tally chart block diagram table data category(ies)
		change		

## How you can help:

- Practise KIRFs at home see KIRF handbook
- Use precise mathematical vocabulary with your children

## Thank you for your time! Any questions?