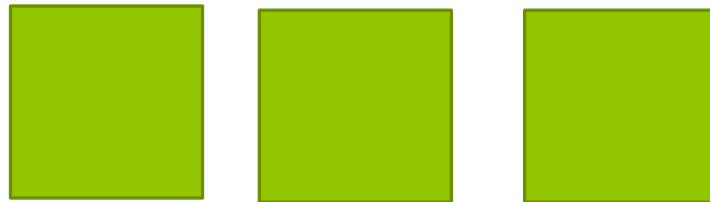




Use the digits 1 to 9 to make the calculation correct – you can use each digit once only



The letters A to J each corresponds to one of the digits 0-9. The same letter represents the same digit to make the calculations correct . What do the letters A to J represent?

$$\begin{array}{r}
 \textcircled{\bullet} \quad \text{A} \quad \text{A} \quad \text{A} \\
 \textcircled{\bullet} \quad + \quad \quad \quad \text{B} \\
 \hline
 \textcircled{\bullet} \quad \text{B} \quad \text{C} \quad \text{C} \quad \text{C}
 \end{array}$$

$$\begin{array}{r}
 \text{A} \quad \text{G} \quad \text{E} \quad \text{F} \\
 + \text{B} \quad \text{C} \quad \text{D} \quad \text{G} \\
 \hline
 \text{B} \quad \text{C} \quad \text{E} \quad \text{G} \quad \text{H}
 \end{array}$$



$$\begin{array}{r}
 \text{J} \quad \text{A} \quad \text{B} \quad \text{G} \\
 \quad \quad \quad \text{B} \quad \text{G} \\
 + \text{I} \quad \text{D} \quad \text{H} \quad \text{E} \\
 \hline
 \text{D} \quad \text{F} \quad \text{G} \quad \text{E}
 \end{array}$$



ST. DUNSTAN'S



Progression and Mastery in Mathematics

Wednesday 30th September
2015

Mrs Costin and Ms Murphy



Progression and Mastery in Mathematics

- **The aims of today's session :**
- Recap changes to the National Curriculum in Mathematics
- Develop understanding of 'Mastery' in the Mathematics Curriculum at St Dunstan's.
- Outline progression over the year groups in key mathematical concepts.





Recap changes to the National Curriculum in Mathematics

- In line with the curricula of many high performing jurisdictions * , the National curriculum emphasises the importance of **all pupils** mastering the content taught each year and **discourages** the acceleration of pupils into content from subsequent years.

- *'fewer things in greater depth' ... 'in secure learning rather than relentless, over rapid progression .*





Recap changes to the National Curriculum in Mathematics

The current National curriculum document says:

*'The expectation is that the **majority of pupils will move through the programmes of study at broadly the same pace.***

However, decisions about when to progress should always be based on the **security of pupils' understanding** and their readiness to progress to the next stage.

*Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems **before any acceleration through new content.***

*Those who are not sufficiently fluent with earlier material should **consolidate their understanding**, including through additional practice, **before moving on.***





Recap changes to the National Curriculum in Mathematics

The aim is for all children to gain a **deep understanding** of the content taught in that year, resulting in **sustainable knowledge and skills**.

Key measures :

- Reason mathematically
- Solve increasingly complex problems
- Do so with fluency





Reason mathematically

Follow a line of enquiry , conjecturing relationships and generalisations, and **develop an argument, justification or proof using mathematical language**

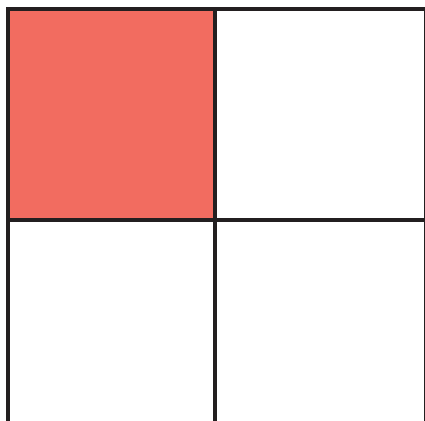


Reason mathematically

Hamsa says the diagrams below show that $\frac{1}{4} > \frac{1}{2}$.

Do you agree?

Explain why.





Solve problems

By **applying** their mathematics to a variety of **routine and non-routine** problems with increasing sophistication, including breaking down problems into a series of smaller steps and persevering in seeking solutions (Struggle zone!) – Thinking back to our opening activity!





Developing fluency

In the fundamentals of maths , including through **varied and frequent practice** with **increasingly complex** problems over time , so that pupils develop **conceptual understanding** and the ability to **recall and apply** knowledge rapidly and accurately.



Developing fluency

- In the 'arithmetic test which questions rely on **conceptual understanding** and the ability to **recall and apply** knowledge rapidly and accurately..... which are mental and which require formal methods ?



$$4.2 + 0.7 =$$

$$\frac{1}{4} + \frac{7}{8} =$$

$$6,347 + 7,605 =$$

$$834 + 100 =$$

$$423,815 - 69,521 =$$

$$1\frac{2}{3} - \frac{1}{4} =$$

$$21.4 - 7.38 =$$

$$70,000 - 700 =$$

What written strategies might pupils use?

Which of the questions do you think pupils will solve using mental calculation methods?

$$14 \overline{) 4105}$$

$$\frac{5}{8} \div 2 =$$

$$63 \div 9 =$$

$$1,210 \div 11 =$$

$$480 \div 4 =$$

$$3 \times 4 \times 6 =$$

$$6^2 =$$

$$1.26 \times 4 =$$

$$713$$

$$43$$

$$13 \times 2\frac{1}{2} =$$

$$\begin{array}{r} \times 27 \\ \hline \end{array}$$

$$\begin{array}{r} \times 35 \\ \hline \end{array}$$

$$1,000 \times 1,000 =$$



Place value, number bonds, times tables – bread and butter!

Facts for free !

Mega Table
Decimals

If I know.. **$7 \times 8 = 56$**

Near facts

Equivalents



Methods of teaching and learning

Mathematics tasks and activities will not always be offered to the children in written form. They may be presented orally, using equipment and as part of a group activity.

The encouragement of discussion, debate and sharing of ideas and strategies will allow children to develop their learning individually and collaboratively, ensuring richness in the teaching and learning.





What do we mean by 'Mastery'?

The essential idea behind mastery is that **all children** need a **deep** understanding of the mathematics they are learning so that:

- future mathematical learning is built on **solid foundations** which do not need to be re-taught;
- there is **no need for separate catch-up** programmes due to some children falling behind;





What do we mean by 'Mastery'?

- children who, under other teaching approaches, can often fall a long way behind, are better able to keep up with their peers, so that gaps in **attainment are narrowed whilst the attainment of all is raised.**





Teaching to Mastery

- Keep the class working together on the same topic (at the same time addressing the need for all pupils to master the curriculum and for others to gain greater proficiency and understanding)
- Challenge is created by going deeper rather than accelerating into new content.
- Teaching is focused , rigorous and thorough ensuring that learning is sufficiently embedded and sustainable over time.





Teaching to Mastery

- Gaps are prevented by speedy teacher intervention.
- More time is spent on teaching topics – allowing for depth and sufficient practice to embed learning.
- Engaging children in reasoning and the development of mathematical thinking.





Teaching to Mastery

- Mastery is much more than being able to memorise key facts and answer test questions accurately and quickly.
- It involves knowing – **Why ?** – as well as knowing that and how.
- Using knowledge appropriately , effectively, flexibly, and creatively – in new and unfamiliar situations.





Teaching to Mastery

- Learning is sustainable over time and can be built on in subsequent years.
- Looking at concepts in depth using a variety of representations and contexts and committing key facts, such as time tables and number bonds to memory.





Some examples : Addition and Subtraction.

- o Mastery progression through the year groups .



$v_f = v_i + at$

H_2O

$v = \frac{d}{t}$

$E = MC^2$

$F = ma$

$a^2 + b^2 = c^2$

$M = 5.9736 \times 10^{24} \text{ kg}$

$w = mg$

$\pi = 3.14159265$

11, 29, 31, 37

4cm

5cm

90°

The central image shows a young child sitting at a table, surrounded by various mathematical and scientific diagrams and formulas. The formulas include $v_f = v_i + at$, H_2O , $v = \frac{d}{t}$, $E = MC^2$, $F = ma$, $a^2 + b^2 = c^2$, $M = 5.9736 \times 10^{24} \text{ kg}$, $w = mg$, and $\pi = 3.14159265$. There are also numbers 11, 29, 31, and 37. A right-angled triangle is shown with sides of 4cm and 5cm, and a 90-degree angle. A globe is also visible.



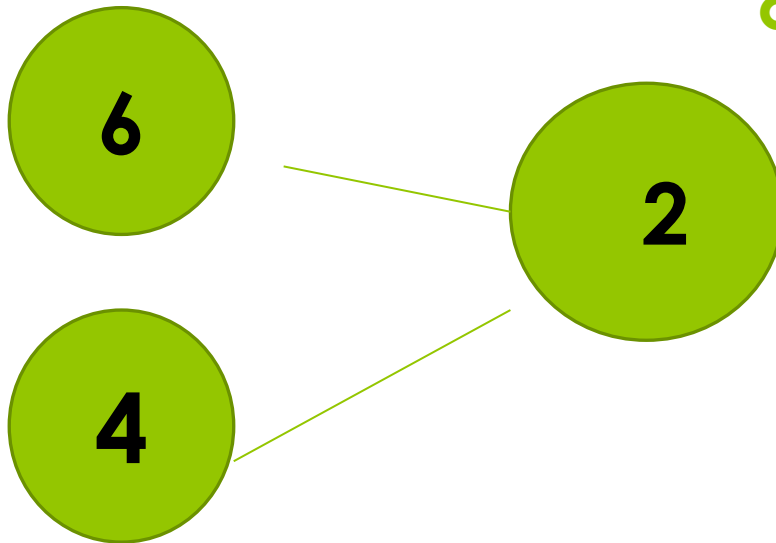


Some examples : Addition and Subtraction.

Pupils should be taught to:

represent and use number bonds and related subtraction facts within 20

add and subtract 1-digit and 2-digit numbers to 20, including 0



- What number sentences can you make ?



Some examples : Addition and Subtraction. Year 1: Mastery

Can you see these number sentences in the picture below?

$3 + 2 = 5$

$2 + 3 = 5$

$5 - 3 = 2$

$5 - 2 = 3$



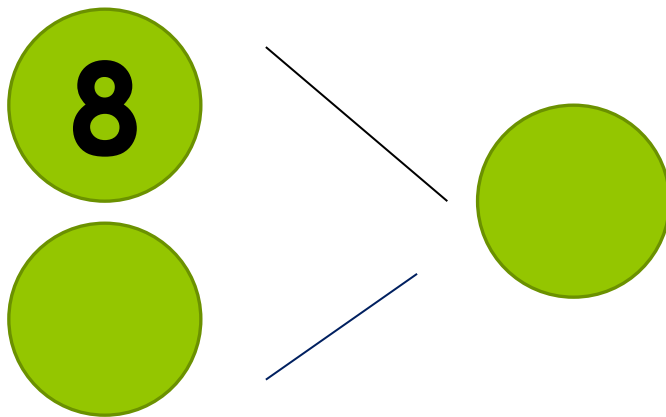
Now write the four number sentences for the picture below:



Some examples : Addition and Subtraction. Year 1: Mastery with greater depth

Draw a bar model for $7 + 2 = 9$ and write four number sentences.

Complete and write the number sentences using this model.



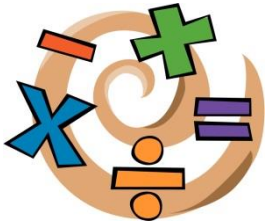


Some examples : Addition and Subtraction.

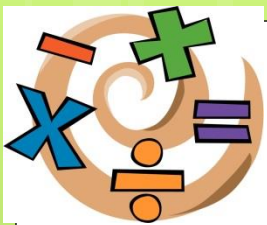
Year 3: Selected National Curriculum Programme of Study Statements

Add and subtract numbers with up to three digits, **using formal written methods of columnar addition and subtraction**

Some examples : Addition and Subtraction. Year 3: Mastery



Using coins, find three ways to make £1.



Some examples : Addition and Subtraction. Year 3: Mastery with greater depth

Sophie has five coins in her pocket. How much money might she have?

What is the greatest amount she can have?

What is the least amount she can have?

If all the coins are different:

What is the greatest amount she can have?

What is the least amount she can have?



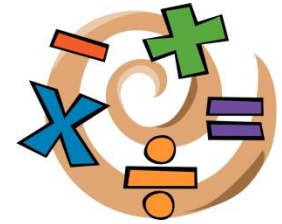
Some examples : Addition and Subtraction- Year 6

**Selected National Curriculum Programme of Study Statements
Pupils should be taught to:**

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Some examples : Addition and Subtraction. Year 6: Mastery



Two numbers have a difference of 238 . The smaller number is 312 .

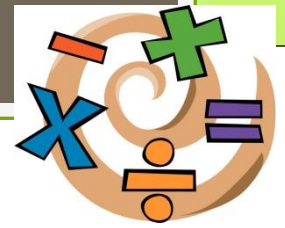
What is the bigger number?

Two numbers have a difference of 23 . They are both less than 10.

What could the numbers be?



Some examples : Addition and Subtraction. Year 6: Mastery with greater depth



Two numbers have a difference of 238 . What could the numbers be if:

the two numbers add up to 6?

one of the numbers is three times as big as the other number?

Two numbers have a difference of 23 . To the nearest 10, they are both 10.

What could the numbers be?

Websites: some suggestions



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Maths activities to support the new curriculum
(other subjects too!):

<http://www.theschoolrun.com/>

Various maths games:

<http://www.transum.org/Software/Game/>

<http://mathszone.co.uk/number-facts-xd/>

<http://www.primaryinteractive.co.uk/maths.htm>

Open-ended maths puzzles:

<http://nrich.maths.org/>

Maths triangles:

http://www.helpingwithmath.com/printables/others/fac0201fact_triangle01.htm



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