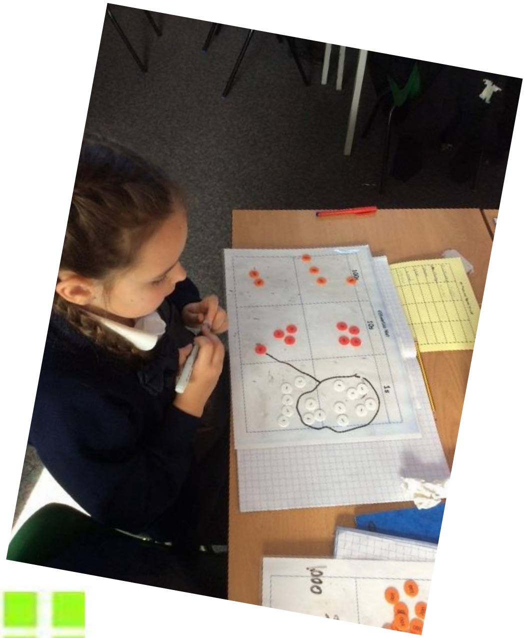
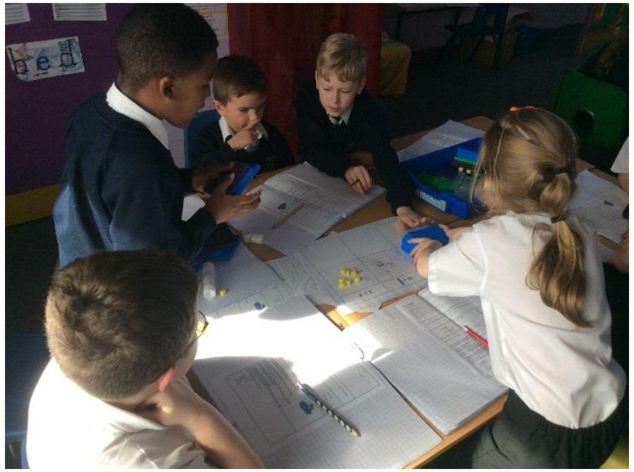


Maths Mastery at Nine Acres



Mastery Pedagogy

- Teachers reinforce an expectation that all pupils are capable of achieving high standards in mathematics.

- The large majority of pupils progress through the curriculum content at the same pace. Variation and is achieved by emphasising deep knowledge and through individual support and intervention.

- Teaching is underpinned by methodical curriculum design and supported by carefully crafted lessons and resources to foster deep conceptual and procedural knowledge.

- Practice and consolidation play a central role. Carefully designed variation within this builds fluency and understanding of underlying mathematical concepts in tandem.

- Teachers use precise questioning in class to test conceptual and procedural knowledge, and assess pupils regularly to identify those requiring intervention so that all pupils keep up.

https://www.ncetm.org.uk/public/files/19990433/Developing_mastery_in_mathematics_october_2014.pdf

Curriculum Design (Long Term Overview)

- Effective mastery curricula in mathematics are designed in relatively small carefully sequenced steps, which must each be mastered before pupils move to the next stage.

- Fundamental skills and knowledge are secured first.

- Focusing on curriculum content in considerable depth at early stages.

Small Steps

- Fractions to percentages
- Equivalent FDP
- Order FDP
- Percentage of an amount (1)
- Percentage of an amount (2)
- Percentages – missing values

Small Steps

- Add and subtract multiples of 100
- Add and subtract 3-digit numbers and ones – not crossing 10
- Add 3-digit and 1-digit numbers – crossing 10
- Subtract a 1-digit number from a 3-digit number – crossing 10
- Add and subtract 3-digit numbers and tens – not crossing 100
- Add a 3-digit number and tens – crossing 100
- Subtract tens from a 3-digit number – crossing 100
- Add and subtract 100s
- Spot the pattern – making it explicit
- Add and subtract a 2-digit and 3-digit number – not crossing 10 or 100
- Add a 2-digit and 3-digit number – crossing 10 or 100
- Subtract a 2-digit number from a 3-digit number – cross the 10 or 100
- Add two 3-digit numbers – not crossing 10 or 100
- Add two 3-digit numbers – crossing 10 or 100
- Subtract a 3-digit number from a 3-digit number – no exchange
- Subtract a 3-digit number from a 3-digit number – exchange
- Estimate answers to calculations
- Check

Teaching Methods

- Teachers are clear that their role is to teach in a precise way which makes it possible for all pupils to engage successfully with tasks at the expected level of challenge.
- Pupils work on the same tasks and engage in common discussions.
- Concepts are often explored together to make mathematical relationships explicit and strengthen pupils' understanding of mathematical connectivity.
- Precise questioning during lessons ensures that pupils develop fluent technical proficiency and think deeply about the underpinning mathematical concepts.

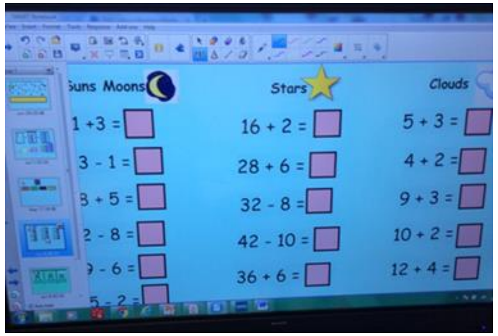
Pupil support and variation

- Variation occurs in the support and intervention provided to different pupils, not in the topics taught, particularly at earlier stages.

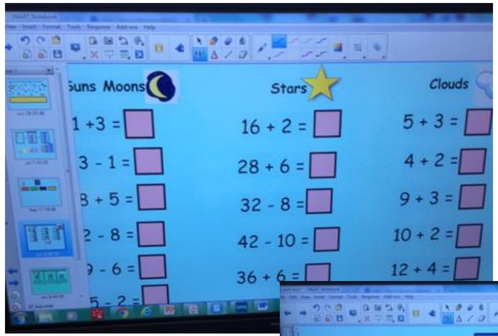
- There is no variation in content taught, but the questioning and scaffolding individual pupils receive in class as they work through problems will differ, with higher attainers challenged through more demanding problems which deepen their knowledge of the same content.
- Pupils’ difficulties and misconceptions are identified through immediate formative assessment and addressed with rapid intervention – commonly through individual or small group support later the same day: there are very few “closing the gap” strategies, because there are very few gaps to close.

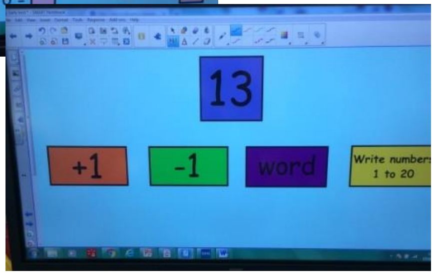
Productivity and practice

- Fluency comes from deep knowledge and practice.
- Pupils work hard and are productive.
- At early stages, explicit learning of multiplication tables is important in the journey towards fluency and contributes to quick and efficient mental calculation.
- Practice leads to other number facts becoming second nature.
- All tasks are chosen and sequenced carefully, offering appropriate variation in order to reveal the underlying mathematical structure to pupils.
- Both class work and homework provide this ‘intelligent practice’, which helps to develop deep and sustainable knowledge.



EARLY BIRD MATHS





Every morning:

- Slides/activities/questions to practise skills
- Independent activity for pupils to get on with straight away
- Recording in Early Bird books
- Revision of previously learnt skills
- Support through guided groups/fewer carefully selected Qs to answer
- Greater Depth challenges
- Finish with times tables chanting and recall of facts

It is recognised that practice is a vital part of learning, but the practice used is **intelligent practice** that both reinforces pupils' procedural fluency and develops their conceptual understanding.

Times Tables Badges

At Nine Acres pupils are encouraged to learn their times tables badges.

Pupils practise quick recall of times table facts in 3 minutes.

Pupils who master their times tables are rewarded with times table badges which they are proud to collect and wear on their school lanyards.

Mental Maths Badges KS1

Pupils in Key Stage 1 are taught quick recall and application of maths facts e.g. number bonds, near doubles, halves and quarters, adding and subtracting 9 etc.

A suggested progression for teaching addition facts

Group A: Year 1 (Within 10)

1.Adding 1 (e.g. 7 + 1 *and* 1 + 7)
2.Doubles of numbers to 5 (e.g. 4 + 4)
3.Adding 2 (e.g. 4 + 2 *and* 2 + 4)
4.Number bonds to 10 (e.g. 8 + 2 *and* 2 + 8)
5.Adding 10 to a number (e.g. 5 + 10 *and* 10 + 5)
6.Adding 0 to a number (e.g. 3 + 0 *and* 0 + 3)
7.Near doubles (e.g. 3 + 4 *and* 4 + 3)
8.The ones without a family! 5 + 3, 3 + 5, 6 + 3, 3 + 6

Group B: Year 2 (Bridging 10)

9.Doubles of numbers to 10 (e.g. 7 + 7)
10.Near doubles (e.g. 5 + 6 *and* 6 +5)
11.Bridging (e.g. 8 + 4 *and* 4 + 8)
12.Compensating

Alongside

Partitioning 2, 3, 4, 5, 6 and 10

Partitioning 7, 8 and 9

Partitioning 11 – 20 into single digit addends

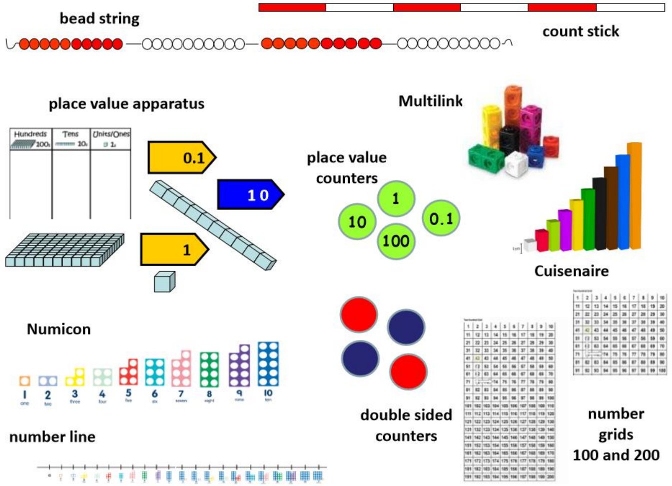
Adding 1 | Bonds to 10 | Adding 10 | Bridging/ compensating
Adding 2 | Adding 0 | Doubles | Near doubles

Y1 facts → Y2 facts

+	0	1	2	3	4	5	6	7	8	9	10
0	0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1	1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	1 + 10
2	2 + 0	2 + 1	2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	2 + 8	2 + 9	2 + 10
3	3 + 0	3 + 1	3 + 2	3 + 3	3 + 4	3 + 5	3 + 6	3 + 7	3 + 8	3 + 9	3 + 10
4	4 + 0	4 + 1	4 + 2	4 + 3	4 + 4	4 + 5	4 + 6	4 + 7	4 + 8	4 + 9	4 + 10
5	5 + 0	5 + 1	5 + 2	5 + 3	5 + 4	5 + 5	5 + 6	5 + 7	5 + 8	5 + 9	5 + 10
6	6 + 0	6 + 1	6 + 2	6 + 3	6 + 4	6 + 5	6 + 6	6 + 7	6 + 8	6 + 9	6 + 10
7	7 + 0	7 + 1	7 + 2	7 + 3	7 + 4	7 + 5	7 + 6	7 + 7	7 + 8	7 + 9	7 + 10
8	8 + 0	8 + 1	8 + 2	8 + 3	8 + 4	8 + 5	8 + 6	8 + 7	8 + 8	8 + 9	8 + 10
9	9 + 0	9 + 1	9 + 2	9 + 3	9 + 4	9 + 5	9 + 6	9 + 7	9 + 8	9 + 9	9 + 10
10	10 + 0	10 + 1	10 + 2	10 + 3	10 + 4	10 + 5	10 + 6	10 + 7	10 + 8	10 + 9	10 + 10

Teaching resources

- Concrete and pictorial representations of mathematics are chosen carefully to help build procedural and conceptual knowledge together. (Bruner)
- Exercises are structured with great care to build deep conceptual knowledge alongside developing procedural fluency. (Variation)
- The focus is on the development of deep structural knowledge and the ability to make connections. Making connections in mathematics deepens knowledge of concepts and procedures, ensures what is learnt is sustained over time, and cuts down the time required to assimilate and master later concepts and techniques.



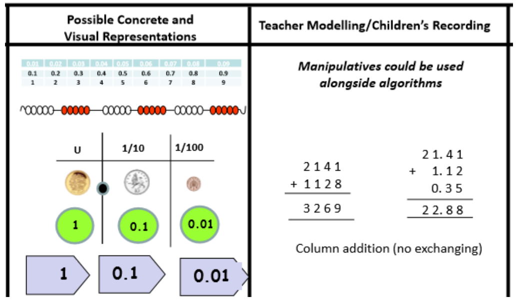
Concrete – Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

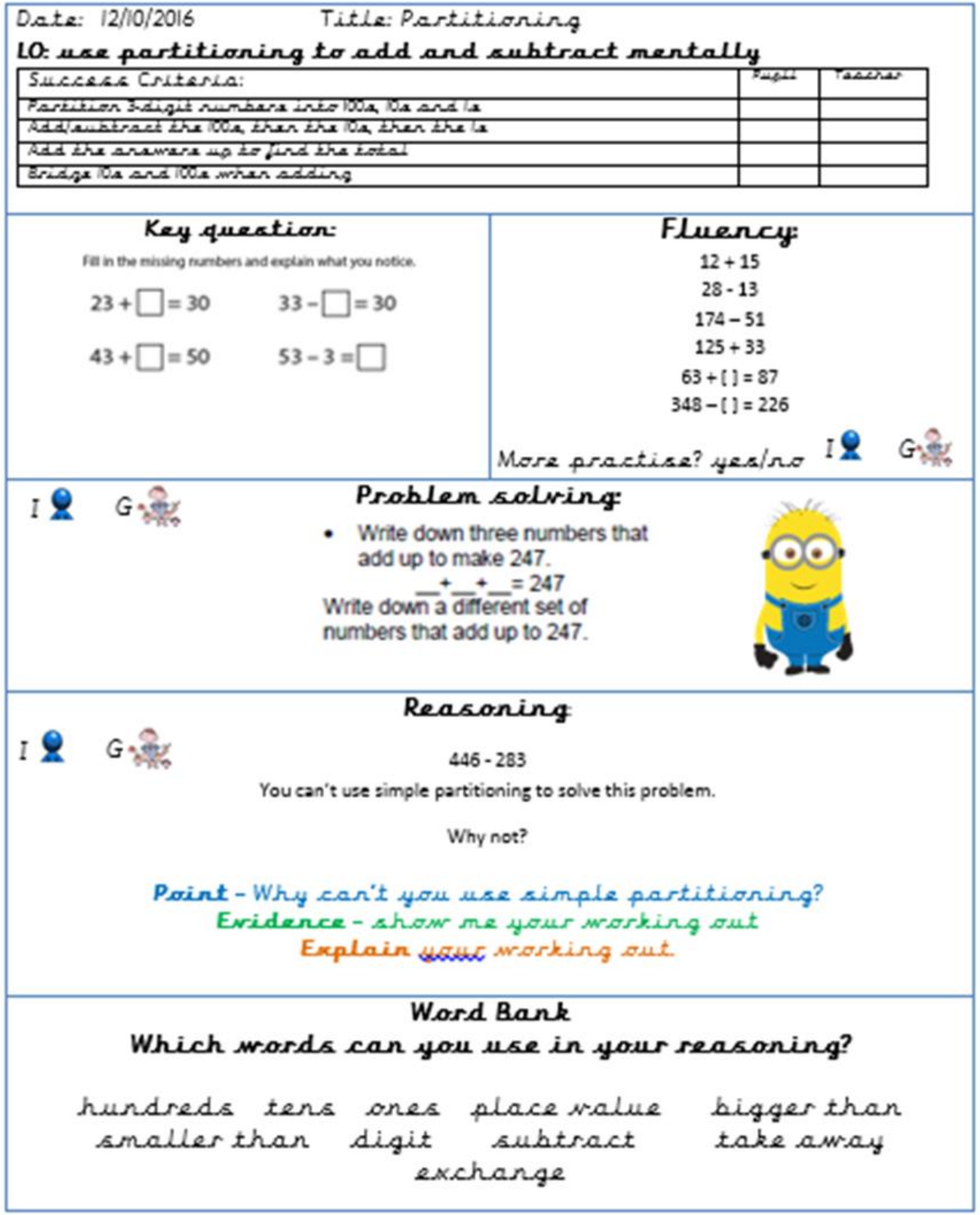
Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.



What do maths lessons look like at Nine Acres?

Across school, our maths lessons follow a similar format to ensure the three fundamental principals of the new curriculum are embedded:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and are able to recall and apply their knowledge rapidly and accurately
- **reason** mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **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 simpler steps and persevering in seeking solutions


Date: 12/10/2016 Title: Partitioning

LO: use partitioning to add and subtract mentally

Success Criteria:	Pupil	Teacher
Partition 3-digit numbers into 100s, 10s and 1s		
Add/subtract the 100s, then the 10s, then the 1s		
Add the answers up to find the total		
Bridge 10s and 100s when adding		

Key question:

Fill in the missing numbers and explain what you notice.

23 + ☐ = 30 33 − ☐ = 30

43 + ☐ = 50 53 − 3 = ☐

Fluency:

12 + 15
28 - 13
174 – 51
125 + 33
63 + [ ] = 87
348 – [ ] = 226

More practise? yes/no I G

I G **Problem solving:**

- Write down three numbers that add up to make 247.

__+__+__ = 247

Write down a different set of numbers that add up to 247.

Reasoning

I G

446 - 283

You can't use simple partitioning to solve this problem.

Why not?

Point – Why can't you use simple partitioning?
Evidence – show me your working out
Explain your working out.

Word Bank

Which words can you use in your reasoning?

hundreds tens ones place value bigger than
smaller than digit subtract take away
exchange

Problem of the Day!

Rich and sophisticated problems that are tailored to allow all children to access and deepen their understanding