Maths at Holy Trinity

October 2018

Try these …

The list below shows the years in which the Cricket World Cup was held since 1992:

1992, 1996, 1999, 2003, 2007, 2011, 2015

Adam says,

Adam is **not** correct.

Explain how you know.

20 In March, Ken collects 2, 3 or 4 eggs each day from his hens.

In the first 20 days, Ken collects 57 eggs altogether.

There are 31 days in March.

What is the **greatest** number of eggs Ken can collect in March?

Show your method

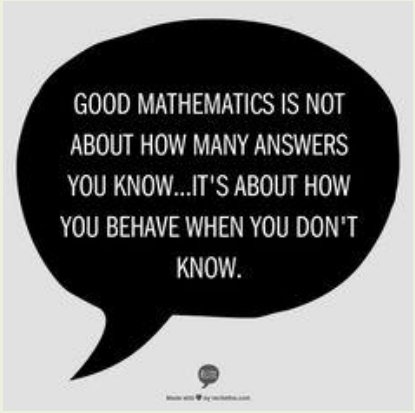
eggs

Growth Mindset

'What separates more successful people from less successful people is not the number of their successes but the number of mistakes they make' (Boaler, 2015)

- Due to the right and wrong nature many children become afraid of maths;
- They are told by others that it is okay not to good be at maths;
- They worry about taking a risk and having a go – maths anxiety is real.
- Maths is not a 'can or cannot do' subject but has areas that we cannot do 'yet'
- It is very easy to help children develop a 'fixed mindset' where maths is concerned, but we want them to have a 'growth mindset'

Growth Mindset



So what can we do:

- Encourage and celebrate mistakes;
- Model perseverance and the excitement of trying again – children naturally do this with computer games all the time;
- Keep it interesting – not simply fact recall;
- Always look for links between mathematical concepts so children can make connections;
- Celebrate the effort not the right answer.

Curriculum Changes

The New Curriculum in 2014 sets higher expectations for pupil achievement and *the expectation is that the majority of pupils will move through the programmes of study* ***at broadly the same pace.***

The research for the review of the National Curriculum showed that it should focus on 'fewer things in greater depth', in secure learning which persists, rather than relentless, over-rapid progression. The new primary curriculum is stated in year-by-year blocks, which helps teachers trace lines of development through key areas of subjects, yet still focusing on the necessary detail of each subject.

(Tim Oates – Life without levels).

Curriculum Changes

For a number of years, teachers have been encouraged to push and accelerate children onto new content without embedding and then deepening understanding of learning – particularly around key skills such as place value, part-part whole relationships and multiplicative reasoning. This has led to the majority of schools in England streaming and setting within whole class settings. It would not be uncommon to see in a year 4 classroom the years 2, 3, 4 and 5 curriculum being presented to different groups of children in one lesson. But how does that affect the quality of learning for all?

As a school we have previously found that setting for maths does not have the maximum impact on attainment and progress and quite often it only benefits one sub group of learners.

Curriculum Changes

Research conducted by The Education Endowment Foundation found that:

> *'overall, setting or streaming appears to benefit higher attaining pupils and be detrimental to the learning of mid-range and lower attaining learners. On average, it does not appear to be an effective strategy for raising the attainment of disadvantaged pupils, who are more likely to be assigned to lower groups. Low attaining learners who are set or streamed fall behind by 1 or 2 months per year, on average, when compared with the progress of similar students in classes with mixed ability groups. It appears likely that routine setting or streaming arrangements undermine low attainers' confidence and discourage the belief that attainment can be improved through effort. Research also suggests that ability grouping can have a longer term negative effect on the attitudes and engagement of low attaining pupils.'*

Current research and the knowledge that the age related expectations in the 2014 national curriculum lend themselves to being taught in mixed ability classes (all children are now expected to have covered the same objectives although some children will be working at a greater depth) has changed the approach to teaching maths nationally.

Maths Mastery

Mastery for ALL is the key concept behind maths mastery – **all** children should master the mathematics curriculum.

Therefore a key element of teaching for mastery is that the whole class is taught mathematics together, with no differentiation by acceleration to new content. The learning needs of individual pupils are addressed through careful scaffolding, skilful questioning and appropriate rapid intervention, in order to provide the necessary support and challenge.

Small-group work typically involves challenge through greater depth for the more able and support with grasping concepts and methods for less-able pupils.

'Variation' in set exercises is also known as 'intelligent practice'. Such exercises usually concentrate on the same topic/method/concept but vary in how the questions are presented, often in ways that expose the underlying concept or mathematical structure, and make pupils think deeply for themselves.

Maths Mastery

Example of differentiation under a non-teaching for mastery approach

Year 3 – Place value of 3 digit numbers
What is the value of the digit underlined?

Red	Orange	Green
1) 3<u>4</u>	1) 2<u>3</u>4	1) 25<u>3</u>4
2) 8<u>5</u>	2) 8<u>5</u>4	2) 8<u>5</u>44
3) <u>9</u>2	3) 4<u>9</u>2	3) 4<u>9</u>22
4) <u>6</u>3	4) 6<u>4</u>3	4) 64<u>5</u>5
5) 4<u>3</u>	5) <u>3</u>42	5) <u>3</u>455
<u>Ext:</u>	<u>Ext:</u>	<u>Ext:</u>
<u>3</u>45	<u>7</u>548	<u>7</u>5485

Red group are clearly "low ability" and are merely working on reduced digits. Whilst green group are "high ability" stretch comes merely from moving onto larger numbers. There is no emphasis on working to understand the concept or the structure which sits behind the maths.

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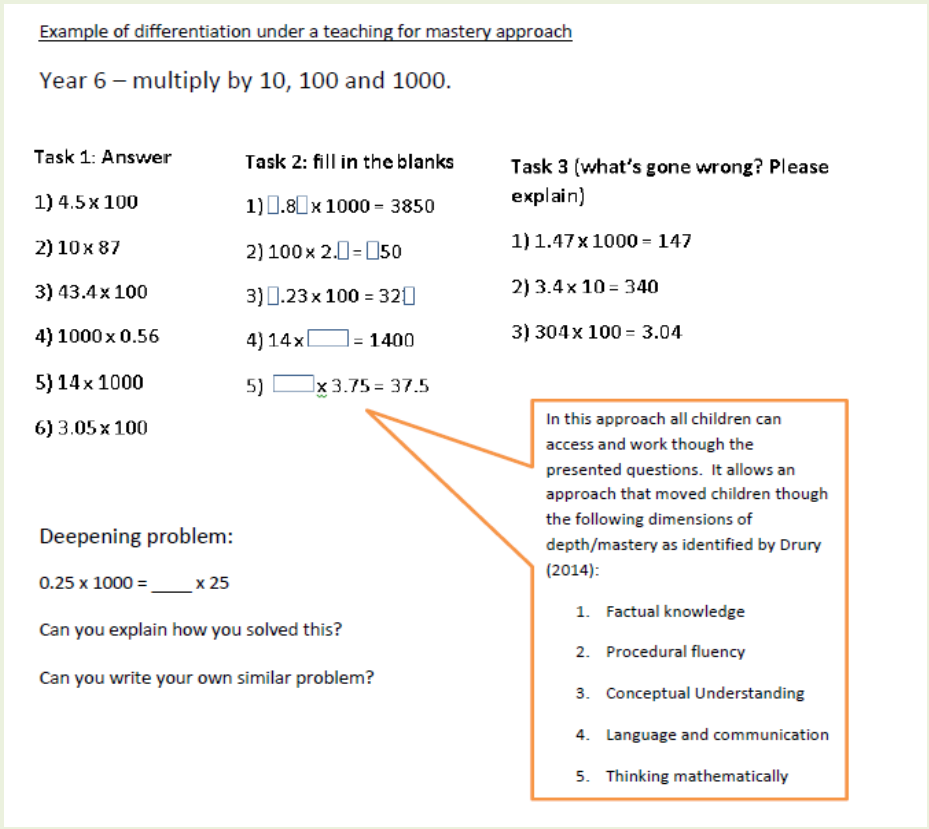
Maths Mastery



Example of differentiation under a teaching for mastery approach

Year 6 – multiply by 10, 100 and 1000.

Task 1: Answer

1) 4.5 x 100

2) 10 x 87

3) 43.4 x 100

4) 1000 x 0.56

5) 14 x 1000

6) 3.05 x 100

Task 2: fill in the blanks

1) □.8□ x 1000 = 3850

2) 100 x 2.□ = □50

3) □.23 x 100 = 32□

4) 14 x ____ = 1400

5) ____ x 3.75 = 37.5

Task 3 (what's gone wrong? Please explain)

1) 1.47 x 1000 = 147

2) 3.4 x 10 = 340

3) 304 x 100 = 3.04

Deepening problem:

0.25 x 1000 = ____ x 25

Can you explain how you solved this?

Can you write your own similar problem?

In this approach all children can access and work though the presented questions. It allows an approach that moved children though the following dimensions of depth/mastery as identified by Drury (2014):

1. Factual knowledge
2. Procedural fluency
3. Conceptual Understanding
4. Language and communication
5. Thinking mathematically

At the core of this approach is the use of key questions which promote deeper thinking:

- *Spot the mistake: -80, -40, 10, 50*
- *Possible answers: Two numbers each with two decimal places round to 23.1 to one decimal place. The total of the numbers is 46.2. What could the numbers be?*
- *What's the same, what's different?*
- *True or false?*
- *Sometimes, always, never?*
- *Is it possible?*

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WRMH

GROWING TOGETHER AS CHILDREN OF GOD

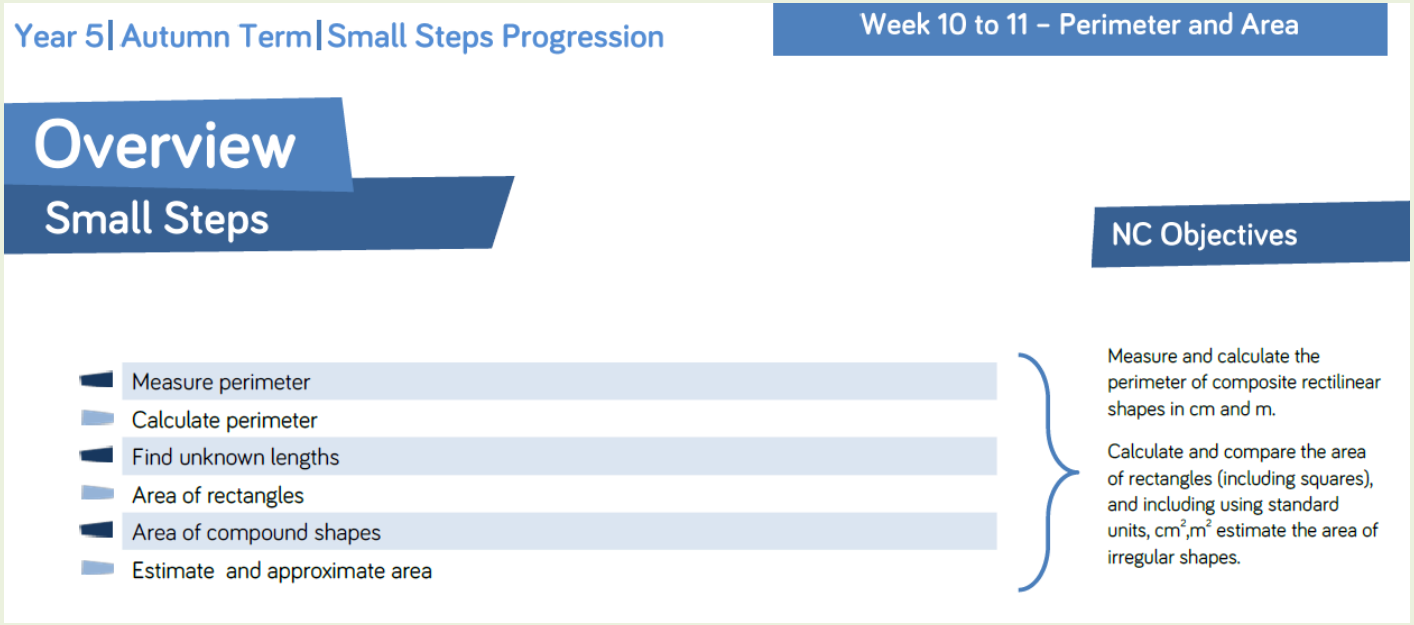
WRMH

Year 3 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number – Place Value			Number – Addition and Subtraction					Number – Multiplication and Division			Consolidation
Spring	Number - Multiplication and Division			Measurement: Money	Statistics		Measurement: length and perimeter			Number - Fractions		Consolidation
Summer	Number – fractions			Measurement: Time			Geometry – Properties of Shapes		Measurement: Mass and Capacity			Consolidation

WRMH

An aspect we really liked is their breakdown into small steps – allowing pupils and teachers to see the progression of skills and knowledge needed to understand the bigger concept.



Year 5| Autumn Term| Small Steps Progression

Week 10 to 11 – Perimeter and Area

Overview

Small Steps

- Measure perimeter
- Calculate perimeter
- Find unknown lengths
- Area of rectangles
- Area of compound shapes
- Estimate and approximate area

NC Objectives

Measure and calculate the perimeter of composite rectilinear shapes in cm and m.

Calculate and compare the area of rectangles (including squares), and including using standard units, cm^2,m^2 estimate the area of irregular shapes.

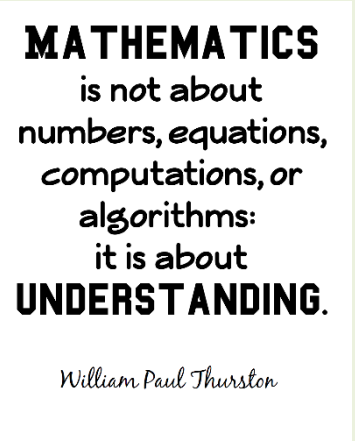
What does being a 'good' mathematician involve?

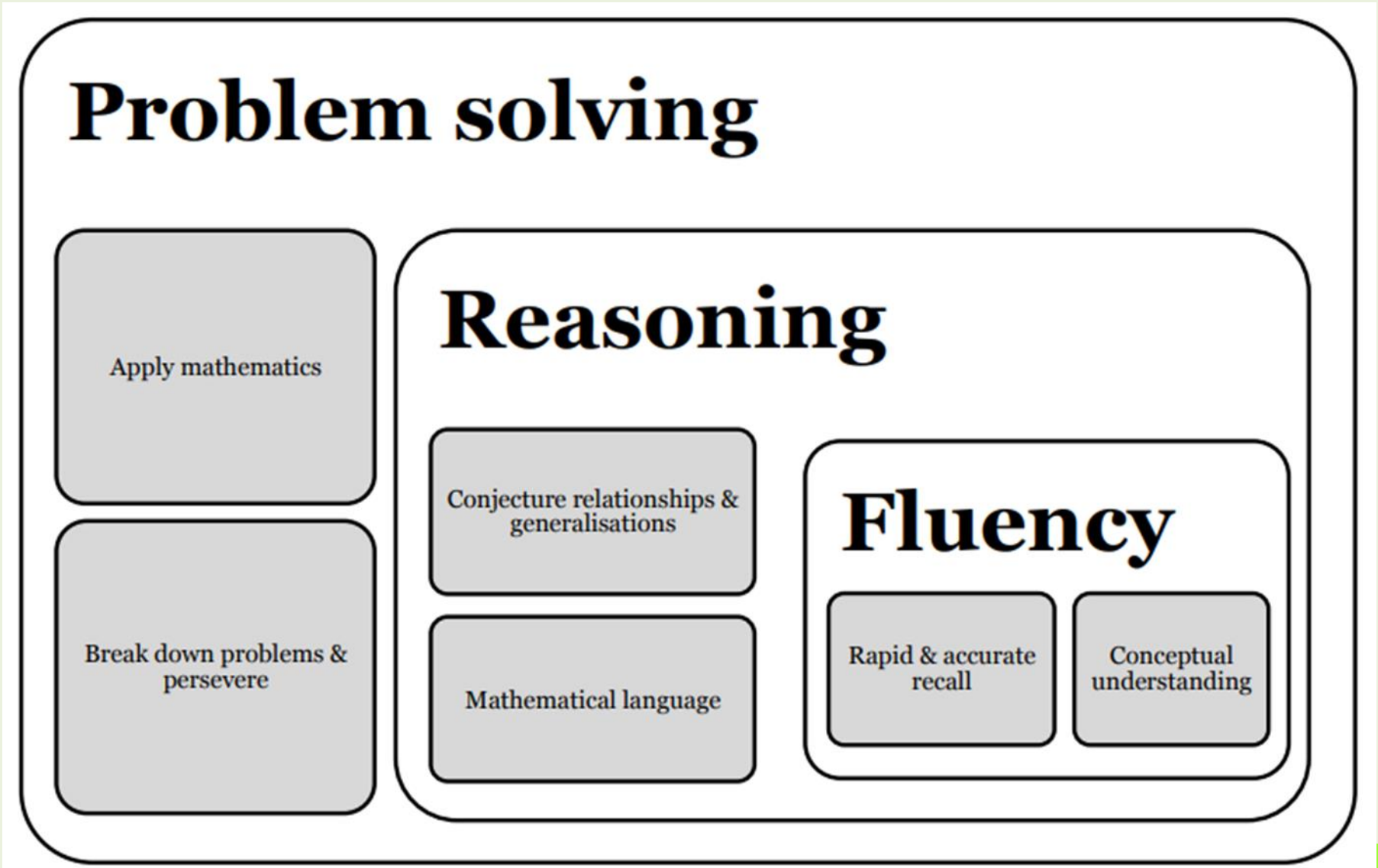
The national curriculum for mathematics aims to ensure that all pupils:

• become **fluent** in the fundamentals of mathematics, including through varied and frequent practice, so that pupils develop conceptual understanding and recall and apply knowledge;

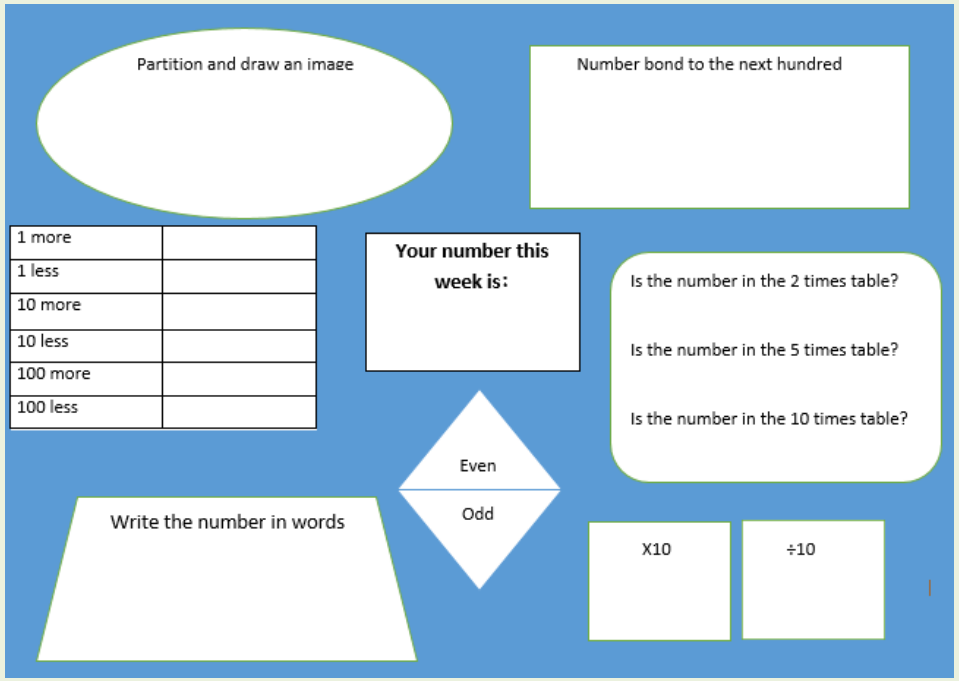
• **reason** mathematically by following a line of enquiry, conjecturing relationships and generalisations, and using mathematical language;

• can **solve problems** by applying their mathematics to a variety of routine and non-routine problems.

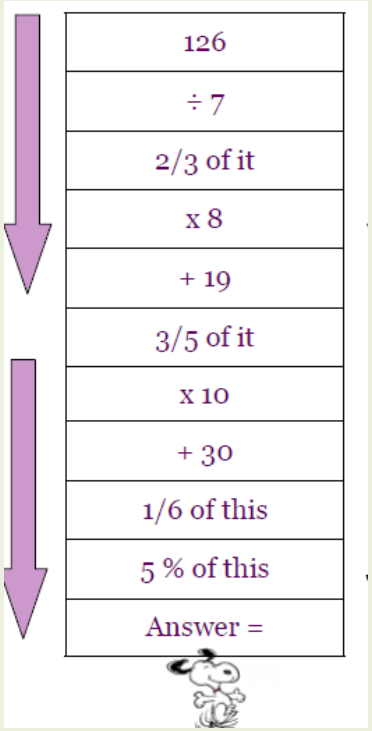



Problem solving
Apply mathematics
Break down problems & persevere
Reasoning
Conjecture relationships & generalisations
Mathematical language
Fluency
Rapid & accurate recall
Conceptual understanding

Fluency activities



- Times tables
- Number bonds
- Using manipulatives to improve conceptual understanding



Conceptual understanding

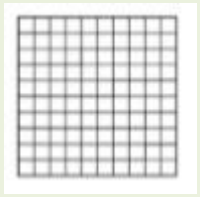
Bead strings

Multilink cubes

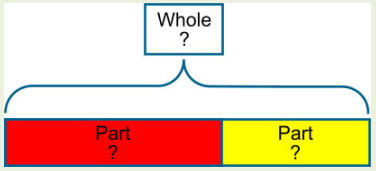
Number line

Cuisenaire rods

100 grids



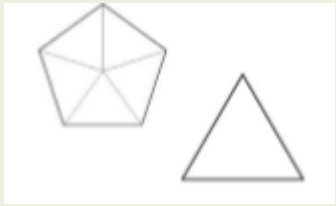
Bar model



Dienes blocks

Fraction towers

Shapes



Reasoning

… research by Terezinha Nunes (2009) identified the ability to reason mathematically as the most important factor in a pupil's success in mathematics.

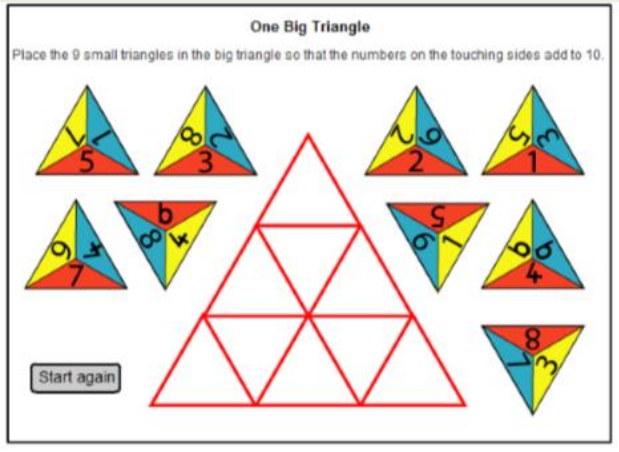
Reasoning

Reasoning relates to a child's mathematical thinking and use of language to support this. Skills involved might include:

- Exploring, wonder, questioning and conjecture;
- Comparing, classifying and sorting;
- Experimenting, play with possibilities, modify an aspect to see what happens;
- Making theories, generalisations and predictions and act purposefully to see what happens.

Reasoning activities

- What do you notice?
- Spot the mistake
- True or false?
- Give an example of…
- Odd one out
- Continue the pattern
- Do, then explain
- Convince me/prove it



I know… so…

$\frac{1}{7}$ of 168 = ☐

$\frac{2}{7}$ of 168 = 48

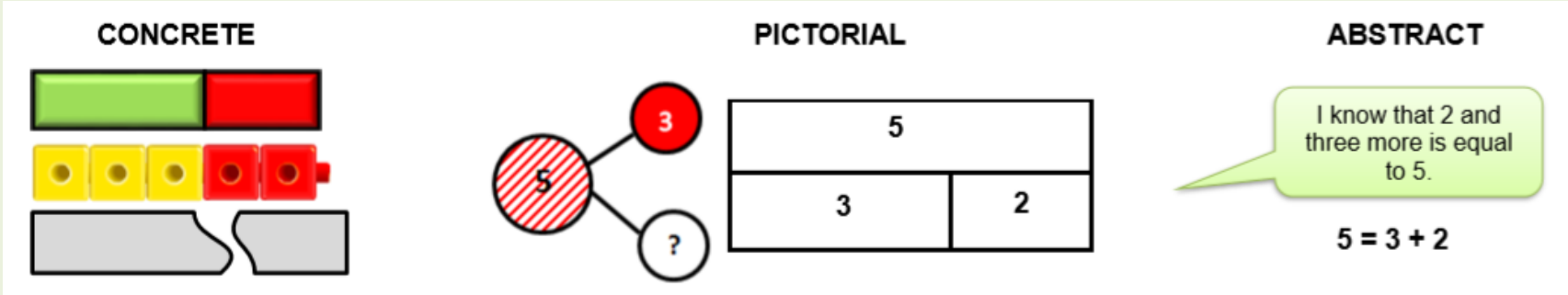
$\frac{2}{7}$ of ☐ = 96

One orange costs nineteen pence. How much will three oranges cost?

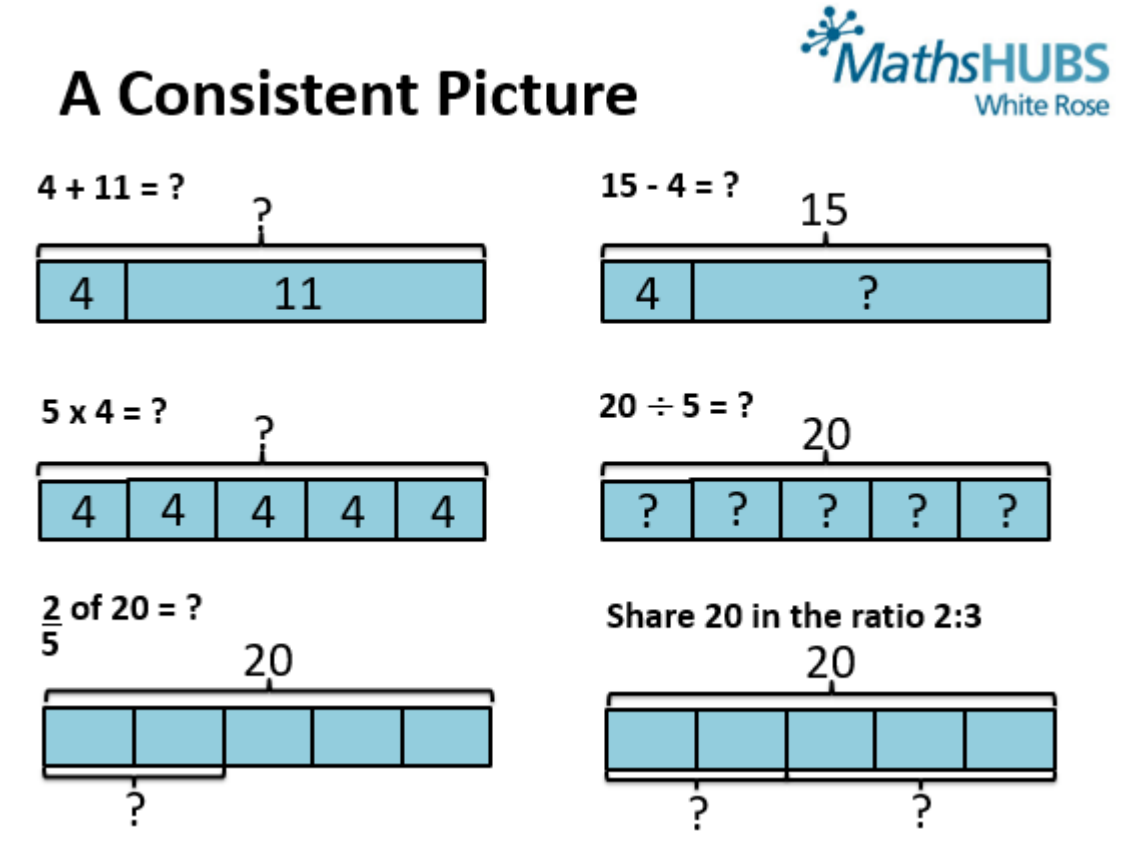
I know that 10 x 3 = 30 and 9 x 3 = 27, so there are 57 oranges.

The Bar Model

Bar modelling is used widely in Singapore, Japan and USA as an effective part of the Concrete, Pictorial, Abstract (CPA) approach to the mastery of mathematics. Concrete materials are embedded alongside pictorial representations and abstract expressions to ensure procedural fluency and conceptual understanding are developed in tandem.



The Bar Model



"When children have experience and exposure to many concrete materials, they are able to develop the ability to visualise"

Ban Har 2016

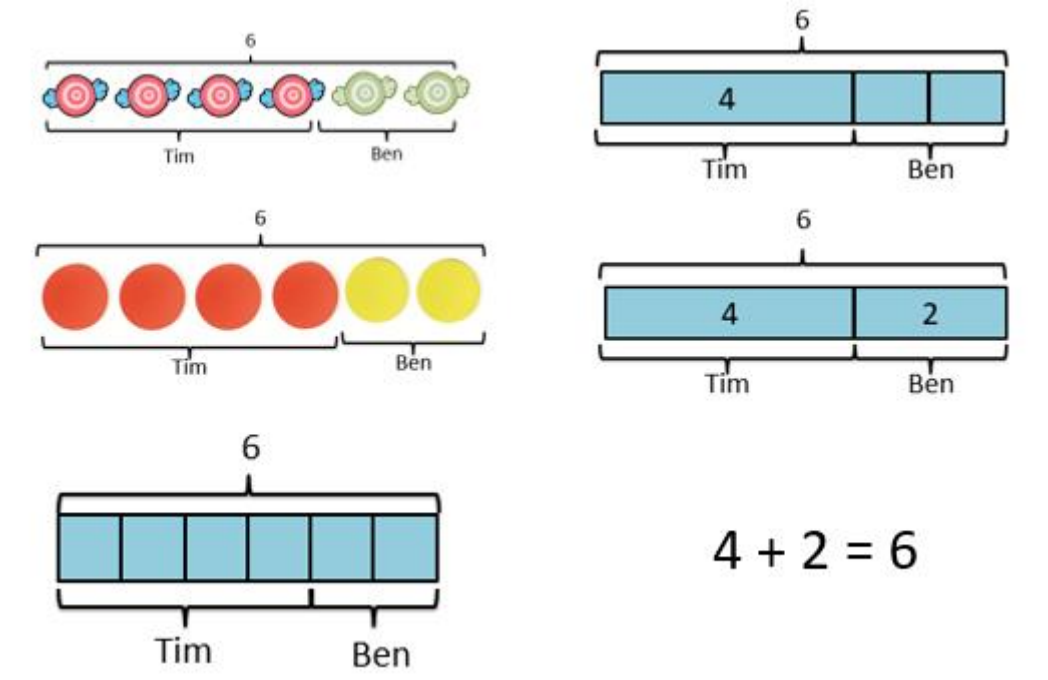
"Instead of relying on superficial and unreliable clues like key words, the simple visual diagrams help children understand why the appropriate operations make sense."

Beckmann 2014

The Bar Model

Tim has 4 sweets and Ben has 2 sweets.

How many sweets do they have altogether?

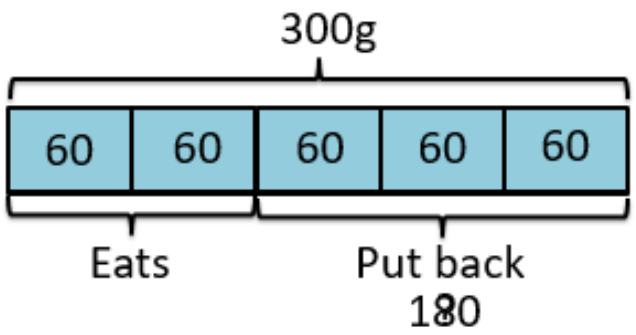


The Bar Model

Solve... Matthew has a 300g block of cheese. He eats $\frac{2}{5}$ of the cheese and puts the rest back in the fridge.

How much cheese did Matthew put back in the fridge?

Model



Calculations

300 ÷ 5 = 60

3 x 60 = 180

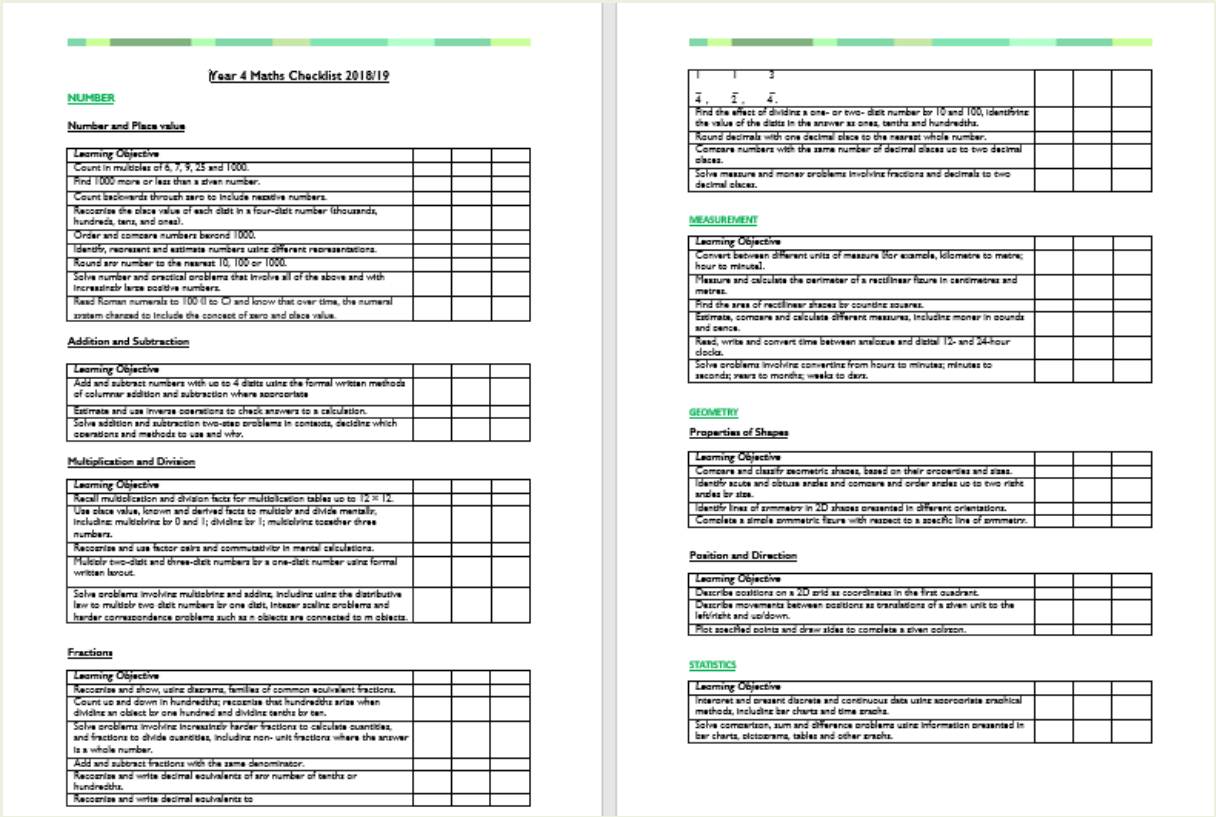
Bar model in school

Dr Yeap Ban Har

How We Assess

- Daily teacher assessment through questioning, targeted activities and conferencing with the children;
- Termly assessment week;
- Levelling using the National Curriculum learning objectives in books – three tick policy;
- Moderation – in house and with cluster schools;
- Moderation by the borough.

How We Assess



Year 4 Maths Checklist 2018/19

NUMBER

Number and Place value

Learning Objective			
Count in multiples of 6, 7, 9, 25 and 1000.			
Find 1000 more or less than a given number.			
Count backwards through zero to include negative numbers.			
Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones).			
Order and compare numbers beyond 1000.			
Identify, represent and estimate numbers using different representations.			
Round any number to the nearest 10, 100 or 1000.			
Solve number and practical problems that involve all of the above and with increasingly large positive numbers.			
Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.			

Addition and Subtraction

Learning Objective			
Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate			
Estimate and use inverse operations to check answers to a calculation.			
Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.			

Multiplication and Division

Learning Objective			
Recall multiplication and division facts for multiplication tables up to 12 × 12.			
Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.			
Recognise and use factor pairs and commutativity in mental calculations.			
Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.			
Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.			

Fractions

Learning Objective			
Recognise and show, using diagrams, families of common equivalent fractions.			
Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.			
Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non- unit fractions where the answer is a whole number.			
Add and subtract fractions with the same denominator.			
Recognise and write decimal equivalents of any number of tenths or hundredths.			
Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$.			
Find the effect of dividing a one- or two- digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.			
Round decimals with one decimal place to the nearest whole number.			
Compare numbers with the same number of decimal places up to two decimal places.			
Solve measure and money problems involving fractions and decimals to two decimal places.			

MEASUREMENT

Learning Objective			
Convert between different units of measure [for example, kilometre to metre; hour to minute].			
Measure and calculate the perimeter of a rectilinear figure in centimetres and metres.			
Find the area of rectilinear shapes by counting squares.			
Estimate, compare and calculate different measures, including money in pounds and pence.			
Read, write and convert time between analogue and digital 12- and 24-hour clocks.			
Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.			

GEOMETRY

Properties of Shapes

Learning Objective			
Compare and classify geometric shapes, based on their properties and sizes.			
Identify acute and obtuse angles and compare and order angles up to two right angles by size.			
Identify lines of symmetry in 2D shapes presented in different orientations.			
Complete a simple symmetric figure with respect to a specific line of symmetry.			

Position and Direction

Learning Objective			
Describe positions on a 2D grid as coordinates in the first quadrant.			
Describe movements between positions as translations of a given unit to the left/right and up/down.			
Plot specified points and draw sides to complete a given polygon.			

STATISTICS

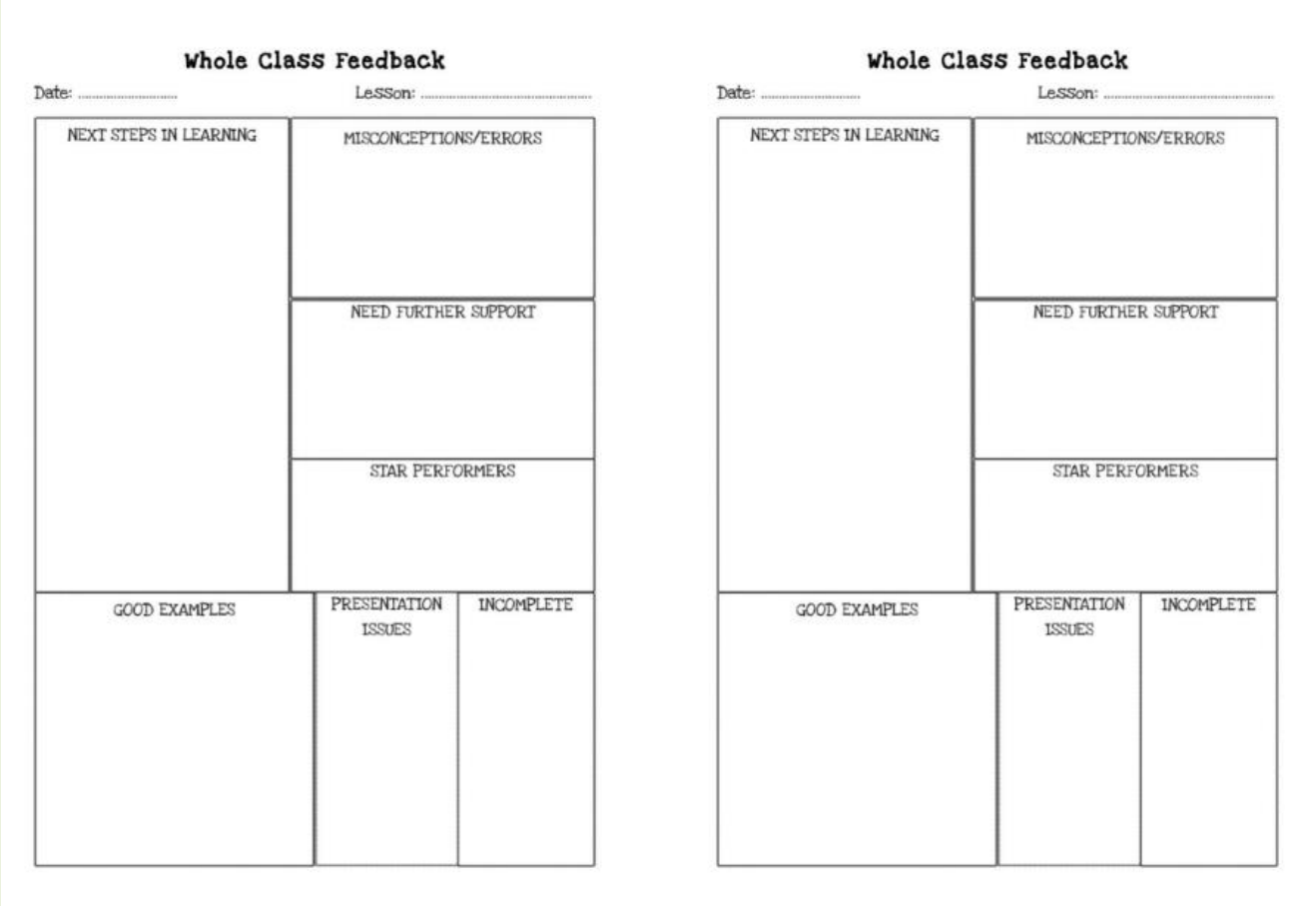
Learning Objective			
Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.			
Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.			

GROWING TOGETHER AS CHILDREN OF GOD

Marking & Feedback

- We have moved away from deep marking and 'next stepping' work towards a more immediate response approach;
- Pupils to self mark some pieces and reflect on learning;
- We endeavour to conference with pupils about their work in class, which might be at different stages throughout the lesson itself or the next day after marking their work.

Marking & Feedback



Whole Class Feedback

Date: ..... Lesson: .....

NEXT STEPS IN LEARNING	MISCONCEPTIONS/ERRORS	
	NEED FURTHER SUPPORT	
	STAR PERFORMERS	
GOOD EXAMPLES	PRESENTATION ISSUES	INCOMPLETE

Whole Class Feedback

Date: ..... Lesson: .....

NEXT STEPS IN LEARNING	MISCONCEPTIONS/ERRORS	
	NEED FURTHER SUPPORT	
	STAR PERFORMERS	
GOOD EXAMPLES	PRESENTATION ISSUES	INCOMPLETE

Support

- In class support – both planned for support and immediate support take place daily
- Interventions – with TAs, with our specialist intervention teacher and with our maths specialist teacher. These maybe small groups or 1:1
- Revisiting daily previous concepts to embed them
- Clearly differentiated tasks and resources targeted at individuals

Challenge

How do we challenge in lessons?

1) Straightforward problems can be adapted to create more opportunities for reasoning and for learning about different problem-solving strategies, by:

- removing intermediate steps
- reversing the problem
- making the problem more open
- asking for all possible solutions
- asking why, so that pupils explain
- asking directly about a mathematical relationship.

2) Questioning, questioning, questioning!

3) Provide opportunities to use and apply mathematical thinking in a variety of scenarios.

Challenge

What other opportunities for challenge are there?

- Challenge Maths Club for Y 4 & 5
- Greater Depth pupils in Y6 having extension lessons
- Participating in regional heats of Maths Quiz Club
- Challenge Maths Days across school

Homework

The focus of homework is Fluency & Rehearsal of skills. We try to ensure that children are always able to complete homework independently or with minimal support. This is especially important in maths to avoid confusion between home and school of what strategies to use.

We use a mixture of Mathletics, our online resource, and worksheets to provide children the opportunity to practice skills and concepts at home.

Next Steps

- Challenge days every half term
- Simmering sessions
- Embedding challenge groups and support across the school
- Bright Sparks page – opportunities for extension and challenge
- After this meeting more resources for parents will be available on the website
- Share My Learning
- Teaching for Mastery project – part of a Teacher Research Group with South West London Maths Hub

Questions

Thank you for your continued support