# Maths Policy

August 24

2017

To be evaluated and revised in December 2017

Herrick Primary School

## Contents

# Vision of Maths at Herrick

**Aim:** Our vision is teaching to Mastery where all children develop sufficient fluency and depth of understanding, so learning is sustainable over time and can be built upon.

**Mastery:** Strong focus on expecting the children to explaining their reasoning using the correct vocabulary – if they can explain their learning to someone else, they have mastered it. *What do you know? How do you know? Can you explain? Prove it? Can you demonstrate it in different ways?*

**Mathematics:** Opportunities are provided for deep learning, problem solving and risk taking in Mathematics – linked to Herrick Learning Attitudes.

**Learning Objective** - All children work from the same Learning objective and individuals are appropriately supported to enable them to achieve. **Basic. Advancing. Deep. (B.A.D.)**

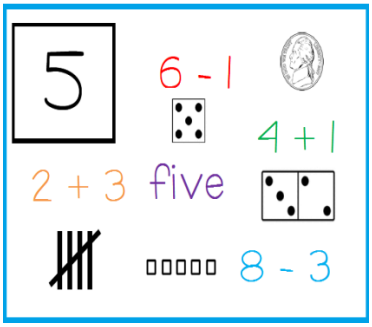
All children begin at **B**asic level and then move on to **A**dvancing followed by **D**eep Learning. Within each 'level of learning', children are appropriately challenged through questioning or resources. All children are given the opportunity to develop and achieve. All children are expected to complete tasks related to the same Learning Objective. However, teachers can differentiate and provide support through appropriate questioning and resources.

## Defining B.A.D.

| Depth of Learning | Cognitive challenge | Nature of progress | Typically, pupils will | Predominant teaching style |
|---|---|---|---|---|
| **Basic** | Low level cognitive demand. Involves following instructions. | Acquiring | name, describe, follow instructions or methods, complete tasks, recall information, ask basic questions, use, match, report, measure, list, illustrate, label, recognise, tell, repeat, arrange, define, memorise. | Modelling Explaining |
| **Advancing** | Higher level of cognitive demand. Involves mental processing beyond recall. Requires some degree of decision making. | Practising | apply skills to solve problems, explain methods, classify, infer, categorise, identify patterns, organise, modify, predict, interpret, summarise, make observations, estimate, compare. | Reminding Guiding |
| **Deep** | Cognitive demands are complex and abstract. Involves problems with multi-steps or more than one possible answer. Requires justification of answers. | Deepening Understanding | solve non-routine problems, appraise, explain concepts, hypothesise, investigate, cite evidence, design, create, prove. | Coaching Mentoring |

**Differentiation:** We are moving away from setting in-relation to ability (except for Year 6). This means Years 1-5 will be mixed and taught together. Within these groups, the aim is to ***deliver the curriculum broadly at the same pace*** to all the children. There will be no differentiation in the content taught, but in the scaffolding and questioning, demands of the problems presented and the level of reasoning expected. Children who require support will have visual aids, concrete objects, mixed ability peers and additional support where necessary will be implemented and evaluated constantly, in order for the children to remain on track and in line with the classroom learning that has been planned for them. More advanced learners will be enriched and have their learning deepened by being encouraged to look at calculations in different ways, by investigating the most efficient methods and by creating and testing their own hypothesis, based on their level of reasoning and understanding.

*A table representing what this would look like:*

<table>
<tr><td>Herrick</td><td>Hands on/ practical</td><td>Visual or conceptual variation</td><td>Do/ apply</td></tr>
<tr><td>Learning</td><td colspan="3">Basic Advancing Deep<br><br>Our aim is to move all children from Basic to Deep<br><br>All children must move on to Advancing, but some may to return to basic before attempting Advancing again<br><br>Once secure with Advancing children move on to Deep</td></tr>
<tr><td>Example</td><td>Flipchart/10 frame, counting stick, 100 Sq.,0-9 digit cards, dice, bead strings, number lines, strips for bar model, unifix cubes, double sided counters, concept cartoons etc.</td><td>Same problem but vary the representation.<br><br> 
</td><td>-Same problem but vary the numbers<br><br>-same problem but vary the unknowns<br><br>-same structure and numbers but vary the context<br><br>-vary the method to solve the problem<br><br>-vary the application of the method</td></tr>
</table>

This approach to teaching moves away from the traditional form and a shift toward ‘deep learning’. This means spending greater time going into depth about a subject as opposed to racing through the content and concepts of the National Curriculum (2014). Previously, this lead to some children having large gaps in subject knowledge because the

concept they had learnt was either too big or not secured.

The teachers have the confidence to take learning at a steadier and deeper pace, providing deeper and richer experiences for all – ensuring children of varying abilities continue to make high levels of progress, whether it be; working towards, working at or working at greater depth in-relation to ARE(age related expectation).

At Herrick, we want our children to spend time becoming true masters of content, applying and being creative with new knowledge and skills in multiple ways. It is our duty to ensure that children have an absolutely solid, concrete understanding of subject knowledge and skills as well as being emotionally resilient for secondary school.

In short, this means working towards:

- *Teach less, learn more: less teacher talk and more evidencing learning and progress*
- *All children supported and challenged: children are confident to take risks and not afraid to make errors*
- *Experience and apply: space and time to ensure children do not fall behind and can develop a deeper understanding*
- *Understanding real life applications: wherever possible to make learning relevant and not abstract; nothing should be taught without a purpose.*

*All of this means that you may see a change in the way we teach and assess your child, most notably will be in how we organize children's' learning and how we report their progress. This approach is seen as good practice. It is promoted by the government and seen as the best way to deliver the new national curriculum.*

# Mathematics Overview for 2017-2018 Academic Year

*How do I start planning?*

**1.** Visit the **Lancashire long-term overview** – this provides guidance as to what you will be teaching each week and provides half-termly documents with guidance on starter sessions, main learning and rationale (units of maths – it isn't always a case of a unit per week);

*An example of Year 2 long-term overview*

**Year 2 Mathematics Yearly Overview**

| | Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
|---|---|---|---|---|---|---|
| **Week 1** | Number and Place value | Counting, multiplication and sorting | Number and Place value | Length and Mass/weight | Number and Place value and statistics | Time |
| **Week 2** | Number and Place value | Statistics | Mass/weight | Addition and subtraction | Addition and subtraction | Multiplication and division |
| **Week 3** | Length and Mass/weight | Fractions Capacity and volume | 2-D and 3-D Shape | Fractions | Capacity and volume and temperature | Statistics including finding the difference |
| **Week 4** | Addition and subtraction | Money | Counting and money | Position and direction | Fractions | Measurement |
| **Week 5** | Addition and subtraction | Time | Multiplication | Time | Position and direction Time | Sorting |
| **Week 6** | 2-D and 3-D shape | Assess and review week | Division | Assess and review week | 2-D and 3-D shape | Assess and review week |

*An example of Year 2 half-termly document*

**Year 2 Autumn 1**

**Starter suggestions for Number**

- Read and write numbers to 100 in figures and words.
- Count on and back in 1s from any one or two-digit number.
- Count on and back in multiples of 2, 5 and 10.
- Order a set of random numbers to 100.
- Recall addition and subtraction facts for each number up to 20.
- Recall doubles of simple 2-digit numbers i.e. numbers in which the ones total less than 10.
- Recall halves of simple even numbers i.e. numbers in which the tens are even.
- Add a single digit number to any 2-digit number.
- Take away a single digit number from 2-digit number.
- Identify number patterns on number lines and hundred squares.

**Starter suggestions for Measurement, Geometry and Statistics**

- Identify 2-D shapes in different orientations and begin to describe them.
- Identify 3-D shapes in different orientations and begin to describe them.
- Compare and sort common 2-D and 3-D shapes and everyday objects.
- Order and arrange combinations of mathematical objects in patterns and sequences.
- Describe position, direction and movement, including whole, half, quarter and three-quarter turns.
- Estimate the length and height of familiar items using standard units.
- Tell the time using o'clock, half past, quarter past and quarter to.
- Recognise and count amounts of money.

| | Main learning | Rationale |
|---|---|---|
| Week 1<br>*Number and Place value*<br><br>Links to Framework for Mathematics<br>Y2 – A1, A2, A3<br>Y3 – A1, A2, A3 | • Read and write numbers to at least 100 in numerals and in words.<br>• Recognise the place value of each digit in a two-digit number (tens, ones).<br>• Identify, represent and estimate numbers using different representations, including the number line.<br>• Compare and order numbers from 0 up to 100; use <, > and = signs.<br>• *Round numbers to at least 100 to the nearest 10.*<br>• Use place value and number facts to solve problems. | Children develop their understanding of the number system to include numbers up to and beyond 100. They should use practical equipment, familiar items and pictures to represent the numbers they are working with – children should understand the notion of grouping in tens i.e. 10 ones is the same as 1 ten and that in two-digit number the first digit refers to the number of groups of ten. Children should experience numbers in different ways to support other place value understanding e.g. ordering numbers on a number line to support comparing and rounding numbers, and also make links between the number line and measuring scales and scales on a graph. |

**2.** Then, look at Target Tracker for your year group in order to form your **Learning** Objectives for the unit. In order to promote **mastery of a concept**, these Learning Objectives are to be narrow and specific. All learning for a particular session is to be linked to the specific learning objective in order to promote **depth of learning through application** rather than 'next steps' learning. For example, if in Year 2 the objective is *count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward,* we would simply break this into several sessions: 1) *to be able to count in twos 2) to be able to count in threes* and so on.

Next, consult the **Progression map** for your year group for the chosen unit. Here you will find a series of questions linked to the unit you are teaching – these will form the key **Success** criteria that will replace lesson success criteria. These questions are to be used as the means of assessment throughout the maths unit being taught. For example (for Year 2, Number and Place Value):

| Year 2 |
|---|
| |
| count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward |
| |
| **Spot the mistake**:<br>45,40,35,25<br>What is wrong with this sequence of numbers?<br><br>**True or False?**<br>I start at 3 and count in threes. I will say 13?<br><br>**What comes next?**<br>41+5=46<br>46+5=51<br>51+5=56<br>…… |

Each question must be followed by:

**What do you know?**

**How do you know?**

**Can you explain?**

**Prove it.**

*An example of this will look like on a planning sheet: – the format of planning is to be completed in a manner that the teacher feels most comfortable and will have he maximum impact on the learning and progression of the children*

| Learning | To be able to count in 2s | To be able to count in 3s | To be able to count in 5s |
|---|---|---|---|
| Success | **Spot the mistake**:<br>8,10,12,14,16,20<br>What is wrong with this sequence of numbers? | **True or False?**<br>I start at 3 and count in threes. I will say 13? | **What comes next?**<br>41+5=46<br>46+5=51<br>51+5=56 |
| | What do you know? How do you know? Can you explain? Prove it? | | |

It is important to remember that planning is flexible and that the day's learning will determine what is to be taught next! To master something, it means you know it really well. It becomes fluent, and you can show someone else how do it.

**3.** Now you should be in a position to create your **problem page** for the unit. This should incorporate an open-ended picture problem that allows for development of a wide range of mathematical concepts / broader thinking. Questions for parents must be included to elicit discussion away from school.

The problem page must be introduced and discussed prior to introduction of a new topic/concept. The older the children the less information is provided in terms of Learning, Success and Vocabulary. The problem page is to be used during the reasoning lessons as a means to record learning. This will become an assessment tool and will reflect the individual learning of each child. It is expected that each child will have access to their P.P.page throughout the maths session. Children need to be taught that learning can be recorded at any time when they consider it to be relevant. This supports independent learning and allows our children to make 'learning their own'. *The P.P.page is an essential part in fostering the Herrick learning attitude.*

*An example of P.P.page – Year 2*

*(Front of P.P.page)*

Name:

Learning

Success ☺ What do you know? How do you know? Can you explain? Prove it.

- Can you name the different coins?
- Can you name the different shapes?
- Which coin is of the most value?

Can you solve this problem?
How many ways can you pay **exactly** for this apple?

14p

**Maths words**

total

£ pound

P pence

Change

price

*(Back of P.P.page)*

Questions to ask your child:

- Can you name all the different silver coins?
- Can you name all the bronze coins?
- When you buy something, What question should you ask to find out how much it costs (**PRICE**)?
- What is change?
- Can you make different amounts using different coins (For example: 50p)

| | |
|---|---|
| I can use the symbol for pounds (£) and pence (p) | |
| I can add different coins to make up a total | |
| I can add different amount of coins to equal the same amount (2p + 1p+ 1p = 2p +2p | |
| Add and subtract money including giving change. | |
| Solve simple problems in involving addition and subtraction of money | |

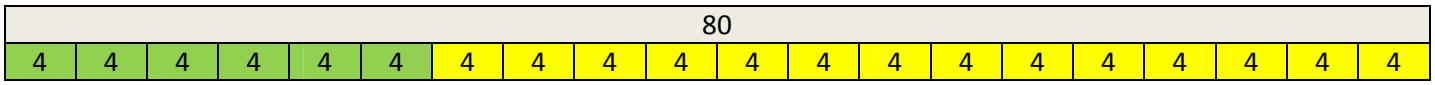
# *What will the structure of the sessions look like?*

**Arithmetic** – 20 mins per week **(Monday Morning) Grey books.**

- Written method – e.g. formal method of addition (columns) modelled by the teacher;
- Bar model method – again modelled by the teacher linking to the same questions as above – this step should include the children manipulating the bar model to show other links between the numbers (e.g. inverse);
- Question – children are asked to create their own question in the form of a word problem that uses the same numbers;
- Peer assessment – the children swap books and check/answer each other's questions;
- Apply learning through tackling a word problem created by the teacher (bar model questions are available as a resource pack for each year group but these must be appropriate and linked to the session's learning). Children must demonstrate that they can solve it using the formal method at hand, but should also show their understanding using the bar model.

**Times tables** – 20 mins per week. **(Friday after assembly) Orange Squared books.**

- Each session will focus on a specific times table;
- A bar model approach will be used to develop understanding of tables facts, for example:




*What are 3 lots of 4?* A teacher should ask this whilst covering up the remaining blocks.

**Potential questions that could be asked:**
*Now we can see three lots of 4, what are six lots of 4 (green bar)?* (Demonstrates the concept of doubling)
*What is the total of the yellow bar? How many lots of 4 make this total?*
*You know what twenty lots of 4 is – what about forty lots of 4?*

- Children should then attempt to write repeated addition sentence linked to the question in hand, e.g.
  *4 + 4 + 4 + 4 + 4 = 5 x 4 = 20*
- They should also write the sentence as follows:
  *Five lots of four = twenty*
- Children should also show this as a bar model.
- Children should elicit all relevant information from the Bar Model and commutative law is to be explored.

All children should be formally tested each week, on a Friday and scores need to be recorded in their red times tables books. Any children falling behind the expected standard should be made aware to the Maths Team – extra provision is to be considered. Times Tables books are to be sent home along with other books each week. Children are informed of the times-tables to be tested the following week and this should be a different focus to what the session's learning focus is.

***An example of Maths being taught in a week at Herrick:***

| Mon | | Tue | Wed | Thur | Fri |
|---|---|---|---|---|---|
| Arithmetic (Grey books) | Learning | | | | Timetables (Grey books) |
| | Success ☺ | | | | |
| Introduction of P.P.page and WDIKA<br><br>Begin a unit of work? | | Reasoning – taken from Lancashire overview and Progression maps (Reasoning books for jottings and explanations/ however grey books can be used if squares are needed for specific written methods or concepts) | | | End a unit of work? |

**Reasoning Sessions (Orange lined and blank paged books) – Tuesday, Wednesday and Thursday**

- Sessions are to have a narrow and specific focus with carefully manipulated steps to success.
- They must incorporate links to prior learning (WDIKA) and high-level questions to promote thinking and reasoning.
- Children's prior knowledge needs to be demonstrated through the use of the learning page and through the use of the unit WDIKA page. This page should make reference to language and any cross-unit links that the children can elicit from the given problem, statement or question.
- It is essential that the children use the lined page to compose a written response and level of reasoning to the problems posed during the session. It is imperative here that our children are demonstrating their understanding to deep and meaningful questions, rather than to simple and basic (fluency) level questions. Linked to the written responses, the children should use the blank page to demonstrate the Bar Model, create pictorial representations and record any jottings that will assist in obtaining the required level of reasoning and outcomes (to be identified or some form of indication given for the specific jottings to their written reasoning problem, in order to make it clear to the reader).
- A success question must be shown to the children, which will allow for them to demonstrate their level of learning (these can be created by the teacher or possible relevant questions can be found in the supporting Mastery and Progressions documents). From this question and understanding of the child's ability to reason and understand during the session (AfL), their next steps should be identified and catered for during the planning phase for the learning that is to follow.
- Any misconceptions are to be celebrated and used as points of learning during the session or as part of future learning.
- The children must identify any unit-specific vocabulary that they have used during their written responses by highlighting them.
- At the end of a unit, the children should demonstrate their progress and learning through accessing an end-of-unit question, which is open-ended and allows for a written, reasoning response. This can be supported by the use of pictorials.

**Problem Page must have:**

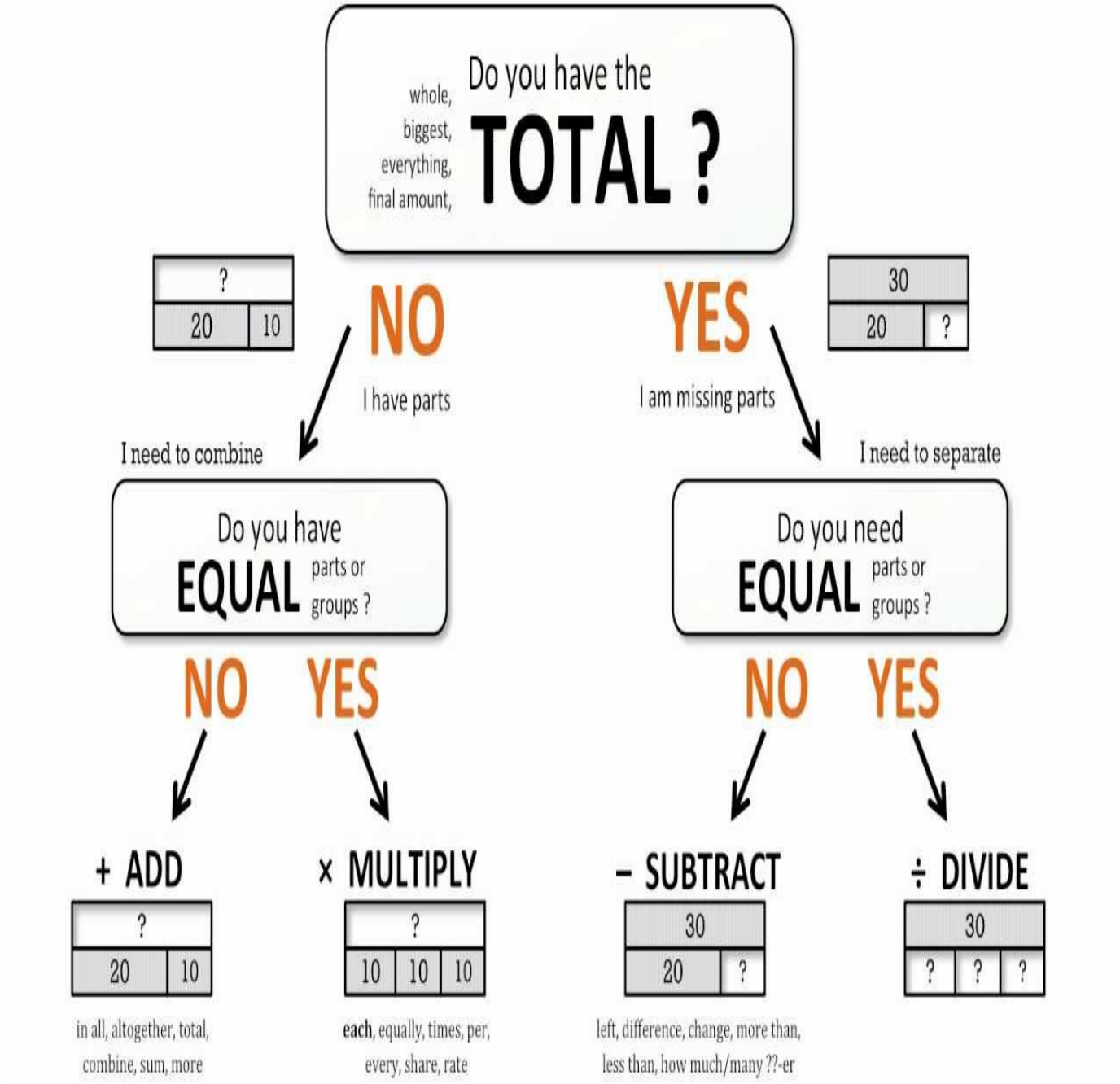
- An open ended problem or pictorial that allows for all children to access it at their own level.
- A glossary of words linked to the unit, which you and the children are going to be using and expect to hear and see written in their responses.
- A self-assessment table, which allows them to identify their level of understanding linked to the units objectives.
- A teacher's comment box, which provides next steps for each individual child.
- A child's comment box
- At the end of a unit, the children should demonstrate their progress and learning through accessing an end-of-unit question, which is open-ended and allows for a written, reasoning response.

# Expectations for times tables and relationships

As a school we hold high aspirations and over the coming years our aim is to ensure that pupils are taught to mentally recall multiplication and division facts for times tables up to 12 by the end of year 4 and derive related fact families using knowledge of place value. Here is a guide to the order of learning times tables and connections that should be made:

| Year Group | Autumn | Spring | Summer |
|---|---|---|---|
| Reception | Number bonds to 10 | Number to 20 | 1 or 10 more and less than |
| Year 1 | Counting steps x1, x 2 | x1, X10 | x5, x10 |
| Year 2 | x1, x10, x5 | x2, x4 | x2, x4, x8 |
| Year 3 | x11, x3, x6 | x6, x12 | x3, x6, x12 |
| Year 4 | x2 + x 5 = x7 | x3, x9, x12 | all |
| Year 5 | All times and division facts eg. 4x3=12 12÷3=4 etc. | | |
| Year 6 | Include decimal fact families, explore = as equivalence, include missing numbers and identify relationships on either side of = sign<br><br>12 ÷ 4 = 3, 1.2 ÷ 0.4=3, 12 ÷ 0.4=30, 120 ÷0.04=3000 | | |

- explore the use of the symbol = from year 2 onwards as **equivalence** when moving into missing number or missing digits within multi-step calculations. The position of the = symbol should be manipulated within the calculations.
- connections between operations are to be made explicit to show inverse eg. 3x2=6; 6÷2=3, as well as the mathematical concept of commutative law.
- children need to explore (with concrete objects) that '4 three times' is the same as '3 four times': four and four and four gives them 12, and three and three and three and three also give 12. Emphasise commutative law where you swap the factors around to give the same product eg. 2 x 4 = 4 x 2 Different calculation (number sentence) but the same answer.
- encourage open ended, deep questions eg. How many X and ÷ fact can you give me for 48? Use the doubling and halving strategy to = the same product eg. 6 x 8= 48, 12 x 4= 48, 24 x 2=48, 48 x 1=48, 96 x 0.5=48
- count on and back the multiples of a particular times tables on a counting stick gradually removing post it notes from intervals. Vary between holding it horizontal as well as vertical.
- sometimes rehearse in just odds eg. 4x1, 4x3, 4x5, 4x7 and just in evens
- include multiplying by zero
- link multiplication with area of squares of rectangles
- **record times tables scores on their times tables record sheet and convey to parents/carers on focus for their child**


Do you have the
TOTAL ?
whole, biggest, everything, final amount,
?
20
10
NO
I have parts
YES
I am missing parts
30
20
?
I need to combine
I need to separate
Do you have
EQUAL parts or groups ?
Do you need
EQUAL parts or groups ?
NO
YES
NO
YES
+ ADD
?
20
10
in all, altogether, total, combine, sum, more
× MULTIPLY
?
10
10
10
each, equally, times, per, every, share, rate
– SUBTRACT
30
20
?
left, difference, change, more than, less than, how much/many ??-er
÷ DIVIDE
30
?
?
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