TIMES TABLES ROCK STARS

GROUPING & SHARING
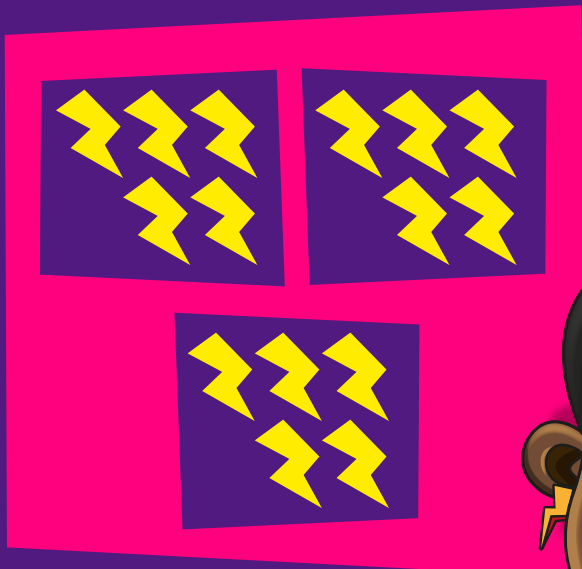
THERE ARE TWO WAYS TO THINK ABOUT DIVISION:

1: GROUPING

(also know as quotative division) is breaking up a quantity into repeated groups of a given size.

There are **30** children playing a game.
(Total given)

They get into teams of **5**.
(Size of each group given)

How many teams will there be?
(Number of groups - unknown)
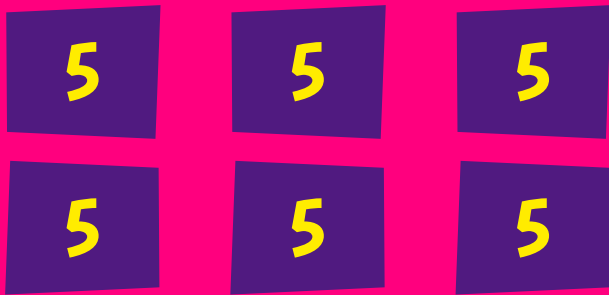
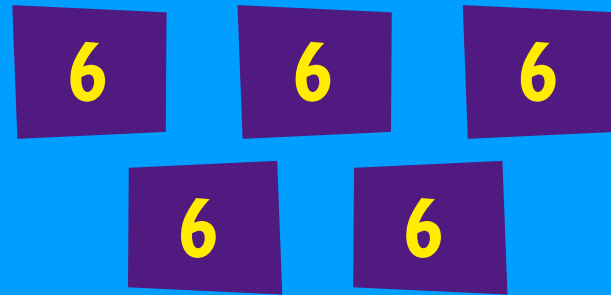|		
5	**5**	**5**
5	**5**	**5**

2: SHARING

(also know as partitive division) is sharing a quantity into a given number of groups.

There are **30** children playing a game.
(Total given)

They get into **5 teams**.
(Number of groups given)

How many children will be in each team?
(Size of groups - unknown)

6	**6**	**6**
6	**6**	

You will find your children's understanding of division is transformed by leaving sharing out of early division. Here's why:

"Times tables" are ultimately a series of multiplication facts which can be applied in the abstract to any multiplicative context. However, if we take the view that we should link equations to structure and representations, which a mastery approach does, then times tables are generally introduced as repeated addition. For example, the five times table represents repeated groups of 5. The twos, fives and tens are introduced in Year 2 in the National Curriculum because these are the repeated group sizes which children have learnt to skip count in already so we can build on this knowledge.

Here's an example from the Year 2 Ready to Progress guidance:

Based on their existing additive knowledge, pupils should be able to represent equal-group contexts with repeated addition expressions, for example 5+5 + 5. They should then learn to write multiplication expressions to represent the same contexts, for example 3 × 5 . Pupils must be able to explain how each term in a multiplication expression links to the context it represents.

Pupils must also be able to understand equivalence between a repeated addition expression and a multiplication expression: 5 + 5 + 5 = 3×5.

Pupils should then learn to calculate the total number of items (the product), for contexts based on the 2, 5 and 10 multiplication tables, initially by skip counting. They should be able to write complete multiplication equations, for example 3x5 = 15, and explain how each term links to the context.

From Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England, DfE, June 2020
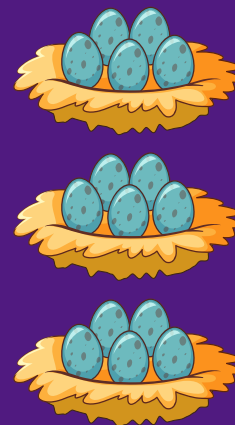
Taking this repeated addition model, within a times table:

-the size of the group remains consistent.
-the number of groups varies.

Incredibly important for us (the teachers) to understand this! Take a minute to think this through and make sure you have got this.

When we as teachers introduce division, it is a new concept for our students and a new symbol to understand. So, taking a mastery approach, we want to make it coherent. We want to connect to, and build on, children's prior knowledge. And what do children know already? They know about repeated groups of a given size. So let's link division to this. Let's introduce division as working out how many groups of a given size we need to make a total. How many groups of 5 do I need to make 15? How many groups of 2 do I need to make 14? And actually, if children are already fluent in their two times tables facts when they meet this, they already know how many groups of 2 they need to make 14. They know it is 7 groups. They know this because they are already totally fluent in saying "Seven twos are fourteen".

So what specifically would have been the issue with using sharing here? Let's have a look at a division image that children often meet, of biscuits in a bag, organised into a sharing structure.

GROUPING REPRESENTATION OF 14÷2=7

14 biscuits　　　　　　**How many groups of 2?**

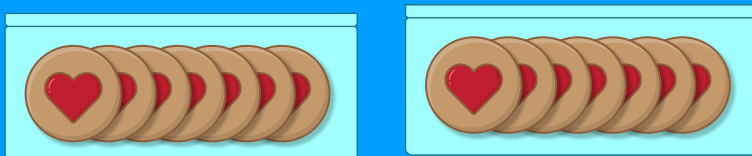**14 biscuits**　　　**divided into groups of 2**　　　**7 bags**

- **Mirrors the structure of the 2 times table**
- **Size of the group remains consistent**
- **Number of groups varies**

SHARING REPRESENTATION OF 14÷2=7

14 biscuits　　　**How many if shared between 2?**

**14 biscuits**　　　**shared into 2 bags**　　　**7 biscuits**

- **Clashes with the structure of the 2 times table**
- **Size of the group varies**
- **Number of groups remains consistent**

When we see dividing by two as grouping, the repeating groups of two which the times table expresses are right there. When we see dividing by two as sharing, we end up with a different group size every time. **There are no repeating groups of 2.**

In repeated addition, the size of the group remains constant and the number of groups varies. **The inverse of repeated addition is grouping.**

Teaching sharing before children are fluent in times tables facts forces children into a "one for you, one for you" dealing out approach to solve divisions. If you see children drawing dots in hoops in your school, it means that you are teaching sharing too early.

Some schemes of work even encourage children to draw dots in hoops, or deal out stuff using a one by one approach! And in sharing, children (and schemes of work) are forced to do this because children have no linked prior knowledge they can build on. This is dividing by 5 but there are groups of 3. Take a minute to think about how confusing this is! In early division. we need dividing by 5 to be all about groups of 5.
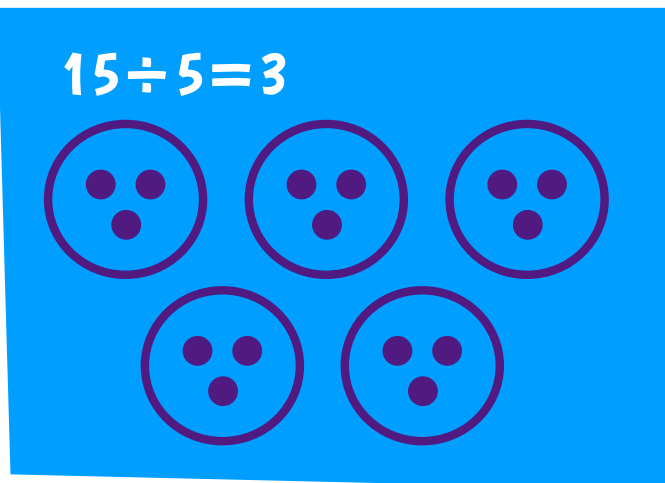
$$15 \div 5 = 3$$

$$15 \div 5 = 3$$

For grouping of course children do have some extremely useful prior knowledge. They know about groups of five! They know about how to skip count in 5s! They know that every time we say the next number in the skip-counting sequence, it is five more! Lots of useful stuff. And they can draw efficient jottings which draw on their prior knowledge, like in the image on the left.

So when and how should sharing be introduced? In terms of a coherent mathematical progression, children don't 'need' sharing until they meet finding unit fractions of a quantity (which is a sharing structure).

So what if you are following a scheme of work which teaches sharing too early? Simply leave out these lessons and don't include sharing until children are fluent in those facts.

IN SUMMARY:

- **Grouping is the inverse of the repeated addition structure of times tables.**

- **Teaching early division through sharing confuses children.**

- **Introduce each new times table through grouping contexts.**

- **Only introduce sharing equations once children are already fluent in the other facts in the fact family.**

TIMES TABLES ROCK STARS

Number Sense Maths