

Developing a whole school approach: Division

Bosley St Mary's Primary School

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Aims

- To consider the development of skills and processes associated with division
- To consider teaching approaches and practical resources to support these and to address misconceptions either whole class or through interventions
- To reflect on your own practice and to identify personal next steps to investigate within your own class teaching



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Zids and Zods



Zids have 4 spots

Zods have 9 spots

Altogether some Zids and Zods have 48 spots

How many Zids are there?

How many Zods are there?

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Independent Education Consultant

Since we last met

- Have you tried anything new within your teaching of mathematics?
- Have you used any new practical resources in connection with multiplication or any other calculation?
- Have you used any new published resources in connection with multiplication ?
- Have you identified any further difficulties or misconceptions that individual children have with their understanding of number or calculation?

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Division at Bosley St Mary's

- How do children record division at Bosley St Mary's?
- What resources do you use?
- What language do you use?



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Division

$$291 \div 3$$

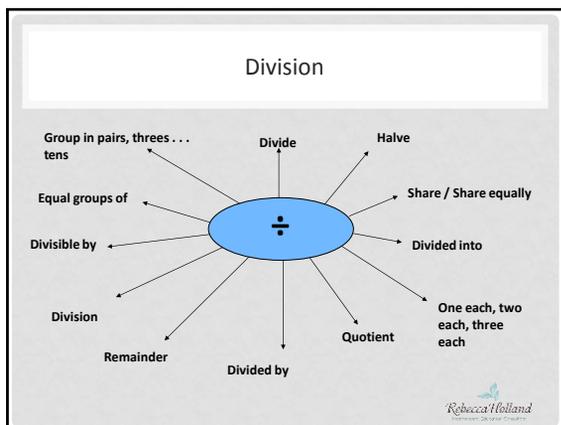
15% of £60.00

$$84 \div 7$$

$$1.6 \div 2$$

$\frac{1}{4}$ of 64

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Prerequisite skills and experiences

- Count forwards and backwards
- Add and subtract accurately and efficiently
- Understand numerical and then abstract composite units, initially through money and skip counting
- A developed knowledge of multiplication as repeated addition and equal groups

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Understanding division

Working with a partner, can you think of three different 'stories' that involve different interpretations of this division calculation?

$12 \div 2$

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Equal sharing of 12 between 2, for example 'Share 12 sweets equally between two children.'

Repeated subtraction of one

Each child has 6 sweets

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Finding one-half of 12, for example 'Joe spends half of £12. How much does he spend?'

Halving

Joe spends £6

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Grouping 12 into twos, for example, 'How many party bags containing 2 sweets can be made from 12 sweets?'

Repeated subtraction of groups

There are 6 party bags

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Reading division calculations

Talk to a partner about the different ways that you could read this calculation to children.

$$12 \div 2$$

- 12 divided by 2
- 12 divided into 2 equal parts
- 12 shared equally between 2

It is sometimes helpful to interpret '12 **divided by** 2' as 'How many twos make 12?'



Division as sharing or grouping

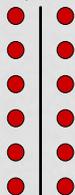
- Take 12 counters and arrange them into 3 equal groups
- Take 12 different counters and arrange them into groups of 3
- Draw a diagram to represent each of the tasks and record the number sentence for each solution



Linking to arrays

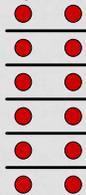
Sharing or finding $\frac{1}{2}$

How many in one column?



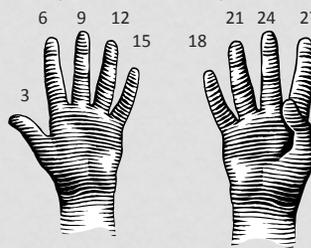
Grouping

How many rows are there?



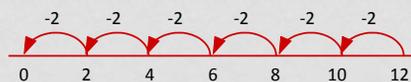
Using composite groups

- How many 3s in 18 is how many units of 3 are there in 18

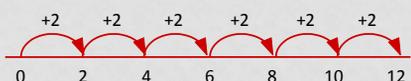


Grouping includes

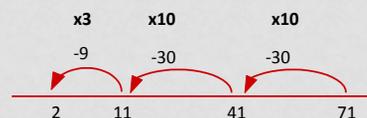
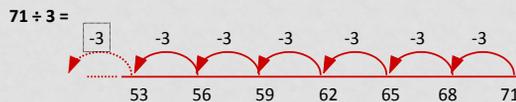
Repeatedly subtracting 2 from 12



Or, repeatedly adding 2 from 0



Improving efficiency by using known facts - chunking

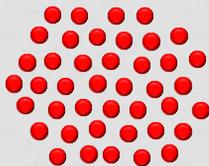


Developing an understanding beyond known facts

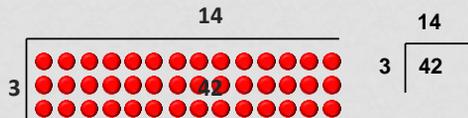
Select some concrete resources to solve the following calculation:

$$42 \div 3 =$$

What image would you want the children to see/visualise?

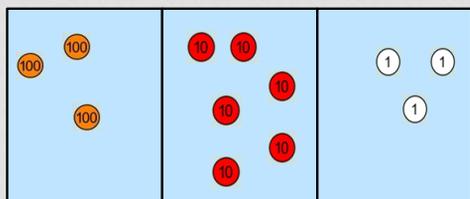


An image for $42 \div 3$



Modelling without remainders

$$\begin{array}{r} 121 \\ 3 \overline{) 363} \end{array}$$



Further examples

Use the place value counters to calculate:

- $364 \div 3$
- $345 \div 3$
- $6882 \div 3$
- $6882 \div 6$

Division: using chunking

$$63 \div 5 = 12 \text{ r } 3$$

$$\begin{array}{r} 5 \overline{) 63} \\ \underline{50} \quad \times 10 \\ 13 \\ \underline{10} \quad \times 2 \\ 3 \end{array}$$



Division using multiplication facts

$$412 \div 7 = 58 \text{ r } 6$$

$$\begin{array}{r} 7 \overline{) 412} \\ \underline{350} \quad \times 50 \\ 62 \\ \underline{56} \quad \times 8 \\ 6 \end{array}$$

Partial tables:

- $7 \times 1 = 7 \quad \therefore 7 \times 10 = 70$
- $7 \times 2 = 14 \quad \therefore 7 \times 20 = 140$
- $7 \times 5 = 35 \quad \therefore 7 \times 50 = 350$

National Curriculum 2014 - Mathematics Appendix 1: Examples of formal written methods for division

Remember it includes – “some examples of formal written methods ... to illustrate the range of methods that **could** be taught.”

Short division

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r}2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r}1 \\ 11 \overline{) 496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer: 45 $\frac{1}{11}$

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National Curriculum 2014 - Mathematics Appendix 1: Examples of formal written methods for division

Long division

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \\ \underline{30} \\ 132 \\ \underline{120} \\ 12 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \\ 132 \\ \underline{120} \\ 12 \end{array} \quad \begin{array}{l} 15 \times 20 \\ 15 \times 8 \end{array}$$

$$\frac{12}{15} = \frac{4}{5}$$

Answer: 28 $\frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28.8

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Remember to create number sense

$$848 \div 16$$

KS2 2006 Paper A level 5

$$364 \div 7$$

KS2 2008 Paper A level 4

$$50 \div \square = 2.5$$

KS2 2003 Paper A level 5

What is 18%
of 50?

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Summary

- Division is not just sharing. Make sure that the language and imagery of sharing are not overemphasised at the expense of the other important structures of division
- Give children plenty of experience of real-life situations involving repeated addition to reach a target and repeated subtraction from a given quantity, making the connection with division. These processes are the basis for the most effective mental and written methods for solving division calculations

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Next steps

- For you:
 - What approaches, resources or visual images will you build into your lessons?
 - .
- For your school:
 - During the summer term decide on whole school approaches to calculations

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