Assessment in Maths

Fractions, Decimals and Percentages

Fareham&Gosport Primary SCITT

Aims of the session:

- To understand the inter-relationship between fractions, decimals and percentages
- To see how children progress in the learning of concepts associated with fractions, decimals and percentages
- To understand what conceptual difficulties children experience when developing their understanding of fractions, decimals and percentages

- To know what to look for when assessing and moderating maths
- To have a clear understanding of the expectations for each year group for maths in the new curriculum
- To take part in a maths assessment and moderation

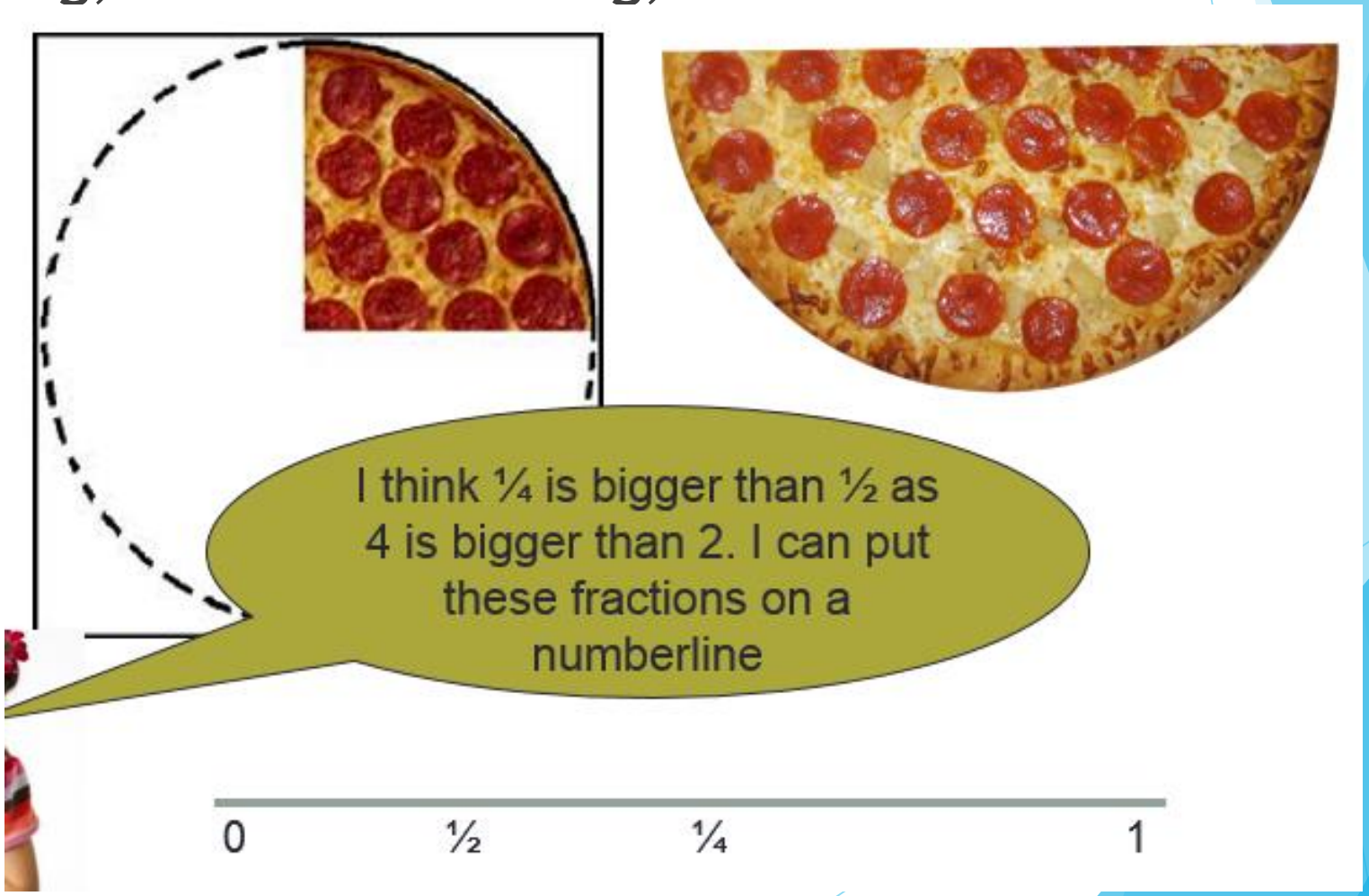
Why is it so difficult to teach fractions, decimals and percentages?

Share books and identify misconceptions in learning related to **fractions, decimals and percentages**

- Identify the misconceptions
- Identify how the misconceptions have been addressed (e.g. follow-up task/marking feedback/intervention)
- Think about how these misconceptions could be addressed, possibly through use of concrete, pictorial and abstract approaches

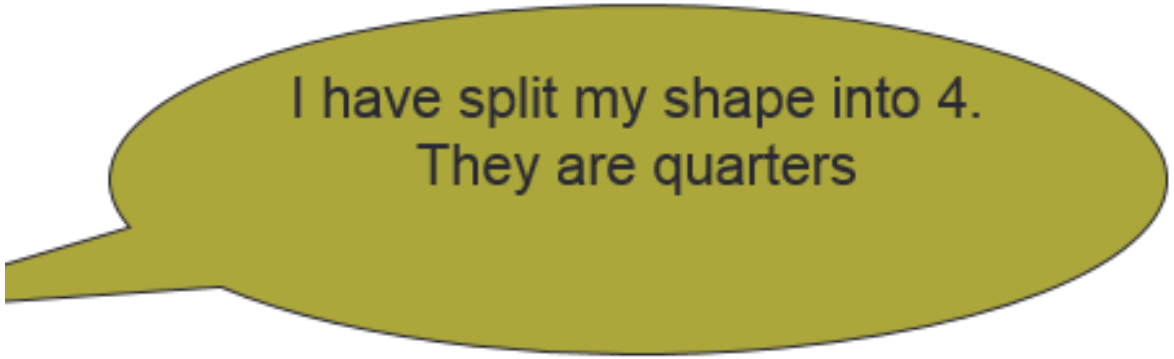
KS1 misconceptions

- Not appreciating, or understanding, the denominator



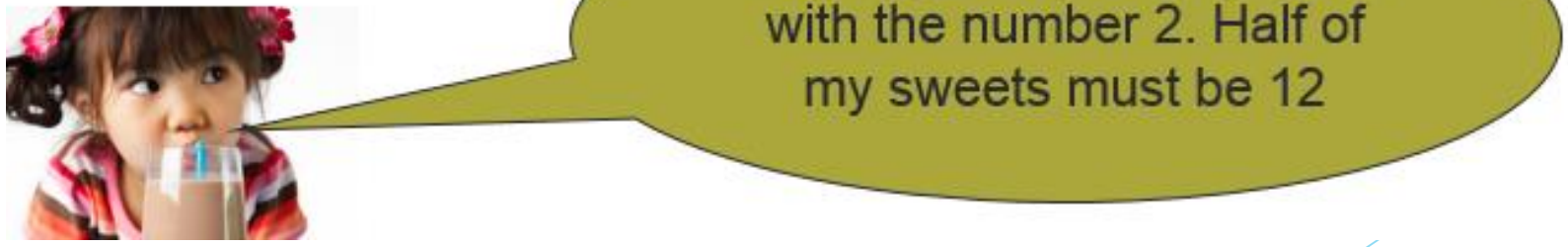
KS1 misconceptions

- Not dividing a shape into equal segments



KS1 misconceptions

- Confusing halving and doubling

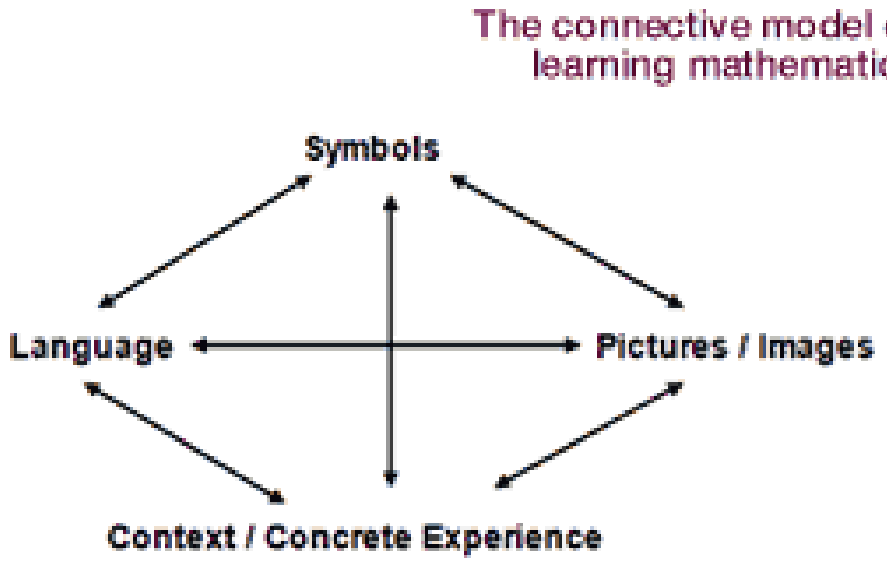


Common misconceptions about fractions, decimals and percentages:

- Fractions are always parts of 1, never bigger than 1
- Fractions are parts of shapes and not numbers in their own right
- A fraction such as ¾ is only ‘three lots of a quarter’, never ‘a quarter of three’
- Decimals with more digits are bigger
- Percentages can never be bigger than 100%
- The greater the denominator, the greater the fraction
- Children (and some adults) often do not appreciate that fractions, decimals and percentages are equivalent ways of writing the same quantity

Make sure you are aware of these misconceptions and plan for them accordingly, possibly using them as teaching points

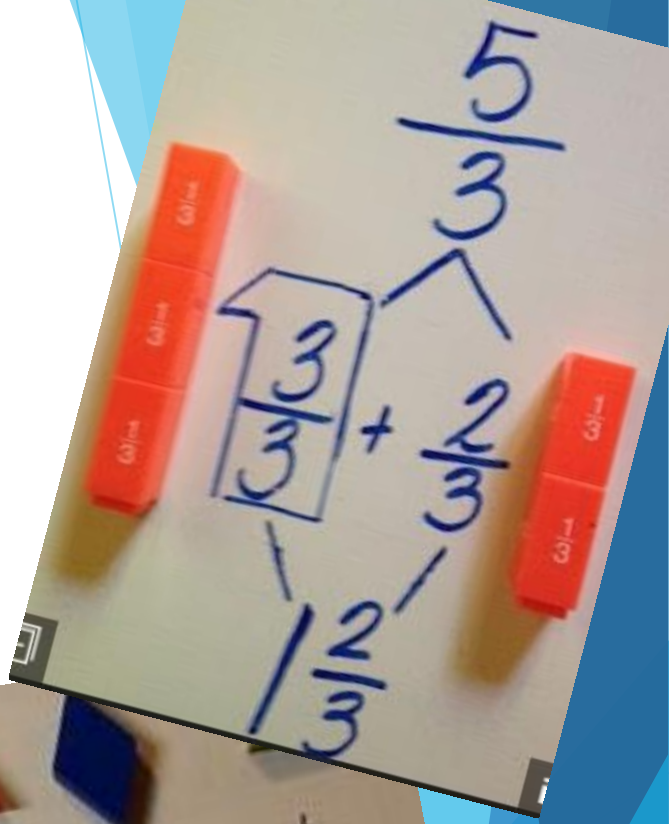
Why is it so difficult to teach fractions, decimals and percentages?

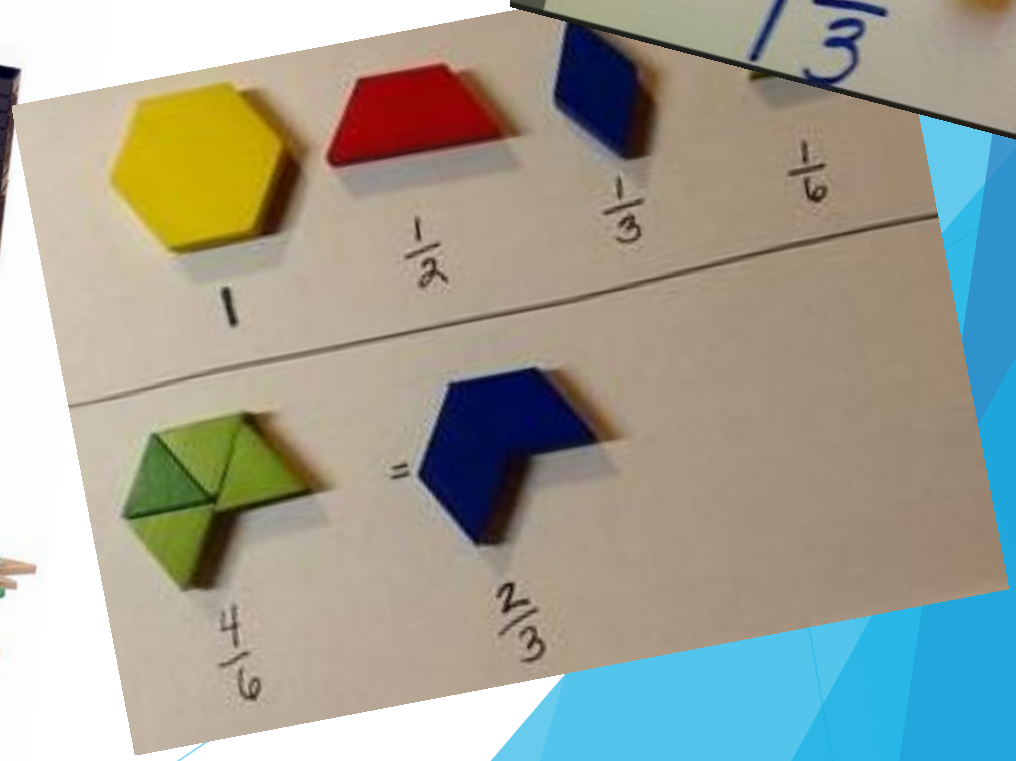


- Problems can arise when not all the four elements are experienced or, if they are all experienced, but they are not connected in a meaningful way.
- The role of classroom talk/dialogue is to help the children make the connections themselves.

The importance of a CPA approach…as a continuum

Children need to have a firm understanding of what the denominator represents and the numerator represents through the use of visual and kinaesthetic resources.





Which concrete resources would help you to solve this following Y2 problem? Which visual models would you use?

Complete:

Half of ☐ is 6

$\frac{2}{4}$ of ☐ is 6

$\frac{1}{4}$ of ☐ = 5

$\frac{3}{4}$ of ☐ = 15

20 children are in a class and $\frac{1}{4}$ are girls. How many are boys?

Mastery…

(checklists to support assessment?)

A pupil **really understands** a mathematical concept, idea or technique if they can:

- *describe it in their own words;*
- *represent it in a variety of ways*
- *explain it to someone else*
- *create examples and non-examples;*
- *see connections with other facts and ideas;*
- *recognise it in new situations and contexts;*
- *make use of it in various ways, including new situations.*

Hampshire County Council

A pupil who has mastered the idea in **greater depth** can:

- *Solve problems of greater complexity (where the approach is not immediately obvious), showing creativity and imagination;*
- *Independently explore and investigate mathematical contexts and structures,*
- *communicate results and generalise the mathematics.*

What might GD look like in books?

- Being able to make the connection between finding half and doubling
- Children are able to make links with other domains e.g. they are able to find fractions of amounts of money and measures
- Children are able to solve two step problems e.g. converting from m to cm before finding a fraction of the length
- They are able to understand and represent fractions as many different representations, and create their own
- They are able to reason mathematically (both verbally and written) about fractions using the correct mathematical vocabulary

Hampshire Assessment Videos Working Party

- 3 specialist maths teachers assigned to each year group
- Teachers undertook mastery tasks with children who were previously assessed as ‘beyond’, ‘securely on track’, ‘close to’ and ‘below’, and filmed the process.
- The 3 teachers then discussed the findings from the video clip and identified evidence (related to the objectives) to assess the child at phase 1.
- The video clips were then watched by all 21 teachers and Jacqui Clifft (HIAS) to moderate the judgements.

Use of Hampshire Assessment Videos (Phase 2 from video 35)

Primary Mathematics Assessment Video Clips

5	STJR adapted	Addition/ subtraction	Close to	Y4 NCETM task	• Formal subtraction method not secure • Uses formal methods every time unless prompted by adult	• Rounding numbers when part of a calculation • Discussing reasoning when deciding whether to work mentally or with formal written methods • Check formal subtraction methods can be modelled using concrete resources for PV exchange • Check can talk through subtraction formal method using appropriate PV vocabulary • Check understands why and uses inverse to check calculations
5	STJK	Addition/ subtraction	Securely on track	Y4 NCETM task	• Can discuss whether mental or written method good choice • Can use formal methods for large numbers	• Rounding 4 and 5 digit numbers • Multi step problem solving in which some parts calculated mentally and some with formal methods • Check formal methods can be modelled using concrete resources for PV exchange • Check can talk through subtraction formal method using appropriate PV vocabulary
5	LM	Multiplication/ division	Securely on track	Y5 NCETM task	• Able to discuss numbers in division calculation number sentence in terms of divisor, quotient and remainder	• Teach and use vocabulary: divisor, quotient and remainder in the context of problem solving • Missing box equations involving more than one operation related to problem solving
5	OW	Multiplication/ division	Below	Y5 NCETM task	• Adult support to work out problem	• TU x U fluency linked to related division facts • Problem solving using division including remainders
5	STJE	Multiplication/	Beyond	Y4	• Can discuss whether mental	• Writing numbers correctly

Using the Hampshire Assessment Videos as a Benchmark

Logan was assessed and moderated as working at ARE in Y3

https://www.youtube.com/playlist?list=PL7DOtBDE9iwesAIEF9kI9iCxUfoNh3a2b

What did Logan show he is secure in?

- Can read fractions correctly
- Understands where 0 and 1 need to be on an ENL
- Understands about estimation/approximation
- Understanding about the numerator affecting size of fraction
- 1/5 is close to 0
- 4/5 add another 1/5 (shade another) would give you 1 whole
- Understanding that 5/5 equals 1 whole
- Some understanding that the larger the denominator; the smaller the fraction (vocab mistake)
- Use of fraction wall/Singapore bar to represent and compare fractions
- Understands part of a fraction must be equal in size/value

What are his next steps?

- Understanding that 2/5 is smaller than ½ (and why)
- Recognising equivalent fractions to be able to compare fractions

Break

Your task…

- Use the mastery tasks (or some alternatives) to work with a Y3 child to assess whether they are working at ARE, below ARE or at GD.

- Think carefully about:
  - Your questioning – how will you find out as much as possible about the child's understanding of fractions?
  - What if the task is too challenging for the child – how will you scaffold the task?
  - What if the task is too easy for the child – how will you extend and deepen their thinking?

- You will need to record elements the child is secure with, and their next steps for progress. Using these notes, observations and objectives for Y3, assess whether the is working at ARE, below ARE or at GD.

A final thought…

Is it that a child is not working at GD, or is the issue that they haven't been given the opportunity to work at GD?

Useful websites/links

Concrete/visual/mental images to support the teaching of fractions, decimals and percentages (and other domains)

http://www.annery-kiln.eu/gaps-misconceptions/all-images.html

Why do fractions and decimals seem difficult to teach and learn?

http://www.annery-kiln.eu/gaps-misconceptions/fractions/why-fractions-difficult.html

Misconceptions in fractions, decimals and percentages

www.ncetm.org.uk/resources/21276

- **NCETM Reasoning document**
- **Hampshire Calculation Model**