

Working in Context to support Mathematical Development:

Examples in Algebra and Data

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- How is context used in the teaching of algebra?

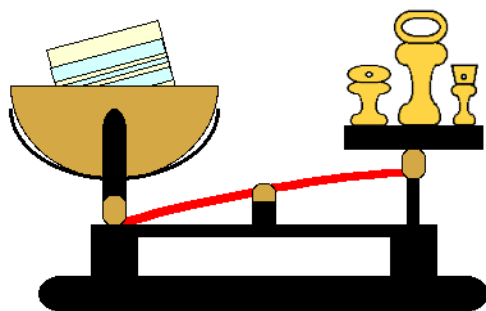
Some traditional approaches

- 'The speed and performance of a car can be described by equations' + photograph
- Humph, Derek and Sairha win a big prize on the lottery, receiving £11 950 between them. Derek receives £100 less than Humph. Sarah gets £50 more than twice what Humph receives. How much money does each person get?

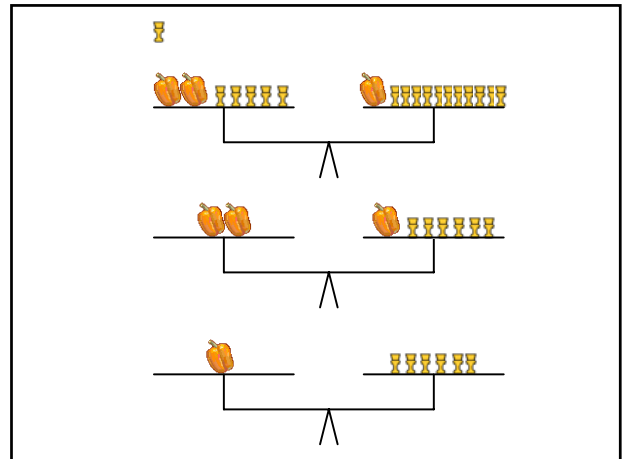
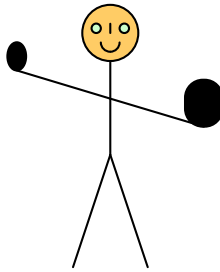
In this session we will:

- Consider ways in which **context** is used in Realistic Mathematics Education (RME)
- Look at how contexts are chosen to support the development of **models** (representations and strategies)
- Look at **how students develop mathematically** through the use of contexts and models

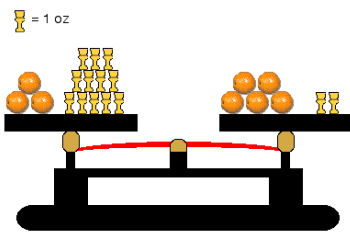
Here is a set of weighing scales.
There is nothing in the dish and there
are no weights on the other side.
How can you tell that these scales are
balanced?



Class activity – The Human Balance



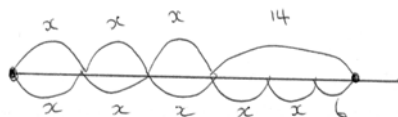
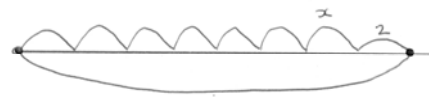
a. Draw your own version of the following picture:



- b. Imagine that you are adding or removing objects from the scales shown. Draw the pictures to match your moves.
 c. What is the weight of one orange?

$$7x + 2 = 30$$

Tommy



Make a number line drawing for the following statements and then try to work out the value of x , showing carefully how you got your answer.

- $5x + 3 = 18$
- $3x + 14 = 5x + 5$
- $5x - 3 = 2x + 7$
- $4x - 5 = 6x - 10$
- $7 - x = 3$
- $10 - 2x = x + 1$

All Things Equal – Learning Landscape

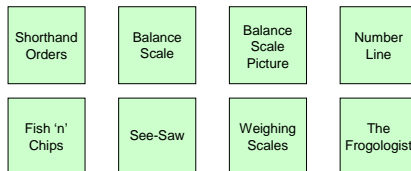
Formal
Abstract
World of Maths

Linear Expansion, Factorisation, Simplification,
Solving Linear Equations

Pre-formal
"Models for"

Equivalence, Balancing, Number Line

Informal
"Models of"



Contexts

Features of contexts and models so far

- Contexts are engaged with, to ensure that they are realisable
- Contexts are chosen deliberately to deliver particular models
- Several **different** contexts are used, which lead to the **same** model, in order to enable learners to generalise (where possible)

Some other examples of using Contexts and Models

- Focus on data
- How is context used traditionally in data?
- How are contexts and models used in data in RME?

Some traditional approaches

Exercise 5a

1 Work out the mode, median and mean of each set of values.

- (a) 5, 7, 9, 9, 8, 7, 10, 9, 11, 12, 5, 9, 9
 (b) 4, 7, 11, 9, 12, 10, 8, 11, 14, 2, 6
 (c) 2, 7, 1, 4, 19, 11, 2, 8, 5, 6

Some contexts for the mean and their associated models

- Crisps
- Charity money
- Birds

Find the total number of accidents

A police station kept records of the number of road traffic accidents in their area each day for 60 days. The figures below give the number of accidents per day:

1, 4, 3, 5, 5, 2, 5, 4, 3, 2, 0, 3, 1, 2, 2, 3, 0, 5, 2, 1
 3, 3, 2, 6, 2, 1, 6, 1, 2, 2, 3, 2, 2, 2, 2, 5, 4, 4, 2, 3,
 3, 1, 4, 1, 7, 3, 3, 0, 2, 5, 4, 3, 3, 4, 3, 4, 5, 3, 5, 2

Football results

A football team keeps a record of the number of goals it scores during the season

No. of goals	Frequency
0	8
1	10
2	12
3	3
4	5
5	2

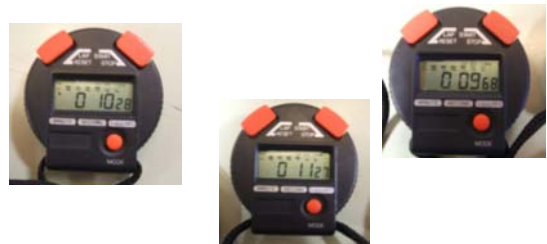
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Features of contexts and models so far

- Questions are posed which encourage learners to return from formal mathematics to context – because this is where they can make sense.

How long is 10 seconds?



Which guess was better, how do you decide?

- Mark each set of guesses on a dot plot
- On your tables list some of the ways you could decide which guess was better

How far can you run in 10 seconds?

Men's 100m. Final. Olympic Games 2004

- 1. Justin Gatlin (USA) 9.85sec
- 2. Francis Obikwelu (POR) 9.86sec
- 3. Maurice Greene (USA) 9.87sec
- 4. Shawn Crawford (USA) 9.89sec
- 5. Asafa Powell (JAM) 9.94sec
- 6. Kim Collins (SKN) 10.00sec
- 7. Obadele Thompson (BAR) 10.10sec
- Aziz Zakari (GHA) DNF

Questions

- How do you choose a good context?

Some summary points

- Embrace the context
- Delay the formal ('guided reinvention' principle)
- Work with a variety of contexts
- Pose questions which encourage learners to return from the formal back to context to enable them to make sense

Access to the classroom resources

- The 'Making Sense of Maths' units are available on the MEI VLE for a charge of £150
- To sample a taster of the materials visit the MEI website www.mei.org.uk/gcse and click on teaching resources

Associated links and reading

- For more examples of the kind included within this paper, we suggest the following websites:
 - www.qcda.gov.uk/22221.aspx QCA's *Engaging mathematics for all learners*
 - www.fi.uu.nl has many articles of interest and really useful applets
 - www.mei.org.uk/gcse2010 under twin GCSE and then choose online resources. This has access to a variety of resources associated with this approach to teaching
 - www.partnership.mmu.ac.uk/cme variety of resources and writing about approaches to teaching
 - <http://mic.britannica.com> Information on MIC
- Heuvel-Panhuizen, M. van den (2003). The didactical use of models in realistic mathematics education: An example from a longitudinal trajectory on percentage. *Educational Studies in Mathematics*, 54(1), pp. 9-36.
- Van den heuvel-Panhuizen, M. (2002). Realistic Mathematics education as work in progress. In F.L.Lin (Ed) *Common Sense in Mathematics Education. Proceedings of 2001 The Netherlands and Taiwan Conference on Mathematics Education*, Taipei, Taiwan (pp. 1 – 42).