


## Models and Images to support learning: Concrete to Abstract understanding

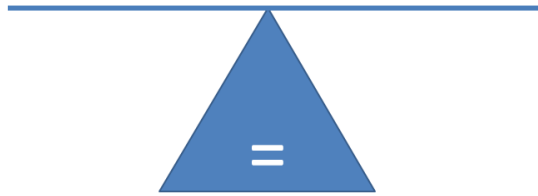
Bar Model Examples:

<p>Can you use the 'bar method' to help you solve the problem?</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="2" style="background-color: red; color: white; text-align: center;">whole</td></tr> <tr><td style="background-color: yellow; text-align: center;">part</td><td style="background-color: yellow; text-align: center;">part</td></tr> </table>		whole		part	part																					
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<p><math>\square - 148 = 67</math></p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="2" style="background-color: red; color: white; text-align: center;">?</td></tr> <tr><td style="background-color: yellow; text-align: center;">148</td><td style="background-color: yellow; text-align: center;">67</td></tr> </table>	?		148	67	<table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="2" style="background-color: red; color: white; text-align: center;">250</td></tr> <tr><td style="background-color: yellow; text-align: center;">145</td><td style="background-color: yellow; text-align: center;">105</td></tr> </table> <p> <math>145 + 105 = 250</math>      <math>250 = 145 + 105</math>  <math>105 + 145 = 250</math>      <math>250 = 105 + 145</math>  <math>250 - 145 = 105</math>      <math>105 = 250 - 145</math>  <math>250 - 105 = 145</math>      <math>145 = 250 - 105</math> </p>	250		145	105																	
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<p><math>245 - \square = 187</math></p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="2" style="background-color: red; color: white; text-align: center;">245</td></tr> <tr><td style="background-color: yellow; text-align: center;">?</td><td style="background-color: yellow; text-align: center;">187</td></tr> </table>	245		?	187	<p><math>\square + 256 = 392</math></p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="2" style="background-color: red; color: white; text-align: center;">392</td></tr> <tr><td style="background-color: yellow; text-align: center;">256</td><td style="background-color: yellow; text-align: center;">?</td></tr> </table>	392		256	?																	
245																										
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<p>Simon buys a book for £4.99 and a pencil case for £3.47. How much change does he get from £10?</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="3" style="background-color: red; color: white; text-align: center;">£10.00</td></tr> <tr><td style="background-color: yellow; text-align: center;">£4.99</td><td style="background-color: yellow; text-align: center;">£3.47</td><td style="background-color: yellow; text-align: center;">?</td></tr> </table>	£10.00			£4.99	£3.47	?	<p>Leah is reading 'Gangsta Granny'. The book has 297 pages. She has read 178 pages. How many more pages does she need to read?</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="2" style="background-color: red; color: white; text-align: center;">297</td></tr> <tr><td style="background-color: yellow; text-align: center;">178</td><td style="background-color: yellow; text-align: center;">?</td></tr> </table>	297		178	?															
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<p>There are 100 pupils in year 7. <math>\frac{2}{5}</math> of the year group wear glasses. How many wear glasses?</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="5" style="background-color: red; color: white; text-align: center;">100</td></tr> <tr><td style="background-color: yellow; text-align: center;">20</td><td style="background-color: yellow; text-align: center;">20</td><td style="background-color: yellow; text-align: center;">20</td><td style="background-color: yellow; text-align: center;">20</td><td style="background-color: yellow; text-align: center;">20</td></tr> </table> <p style="text-align: center;">   <math>\frac{2}{5} = 40</math> children         </p>	100					20	20	20	20	20	<p>Mr Catt says that <math>\frac{3}{5}</math> of year 5 are girls. If there are 30 boys in year 5, how many children are there altogether?</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td colspan="5" style="background-color: red; color: white; text-align: center;">?</td></tr> <tr><td style="background-color: yellow; text-align: center;">B</td><td style="background-color: yellow; text-align: center;">B</td><td style="background-color: yellow; text-align: center;">G</td><td style="background-color: yellow; text-align: center;">G</td><td style="background-color: yellow; text-align: center;">G</td></tr> <tr><td style="background-color: orange; text-align: center;">15</td><td style="background-color: orange; text-align: center;">15</td><td style="background-color: orange; text-align: center;">15</td><td style="background-color: orange; text-align: center;">15</td><td style="background-color: orange; text-align: center;">15</td></tr> </table>	?					B	B	G	G	G	15	15	15	15	15
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15	15	15	15	15																						

**Balance Model:**

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$$25 + 26 = 25 \times 2 + 1$$



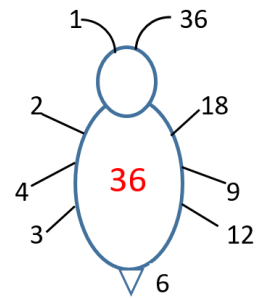
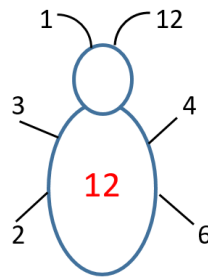
'same as'

The pupils need to have a strong understanding of the = symbol. Understanding that the 'answer' can be written either side of the equals symbol.

**Factor Bugs:**

**FACTOR BUGS**

Square Number



The pupils should understand the antennae are always the 1 and the number itself. Square number bugs will have a tail. Prime number bugs will only have antennae. The legs show factor pairs. You can often see a doubling and halving pattern.

Whole Numbers / Integers						Part Numbers / Decimals				
TM	M	HTh	TTh	Th	H	T	U	t	h	th
Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths
								1/10	1/100	1/1000

Decimal Point - the most boring thing in maths!!

**Rounding:**

Nearest 100:

$$3739 \approx 3700$$

Bossy Number says, "Round down, digit stays the same!"

Nearest 1,000:

$$3739 \approx 4000$$

Bossy Number says, "Round up!"



Place Value – pupils need to understand the difference between whole numbers and part numbers. They need to understand that the decimal point is the fence. The decimal point is very boring and never moves. Each column is 10 times bigger.

Little Miss Bossy is a picture trigger to remind pupils about rounding. The pupils should put an arrow on the place value column they are rounding to and then underline the bossy number. 'Round up' or 'Round down, digit stays the same.'

- X 10 - 1 column bigger
- X 100 - 2 columns bigger
- X 1000 - 3 columns bigger
- 10 - 1 column smaller
- 100 - 2 column smaller
- 1000 - 3 columns smaller

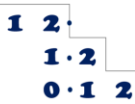
$$3.45 \times 100$$

'Steps' Image:

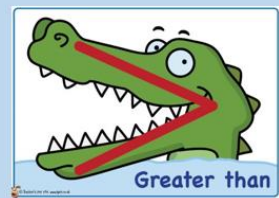


$$12 \div 100$$

'Steps' Image:



'The numbers hold hands and jump!'



'Steps' model is used to support pupils with x/÷ 10, 100 and 1000. The decimal point is always in the same place. 'The numbers hold hand and jump!' – this stops them adding zeros in the wrong place.

The crocodiles help the pupils remember the symbols as the crocodiles eat the biggest! The pupils must also be able to read the symbol with the correct language.



The majority of questions in the KS2 curriculum can be linked back to one of these basic skills:

## Toolkit of skills and knowledge to develop fluency

Understanding equivalence

Number bonds and related facts

Partitioning in different ways



Multiplication facts and related facts

Rounding

Doubling and Halving

Place Value

Knowledge of the number line and counting

Inverse