

## Year 3 - Arithmetic Expectations

This series of documents aims to summarise the number facts, mental calculation strategies and the stage(s) of the progression towards the written methods for each of the four operations.

For each strategy, the concrete and pictorial representations have been suggested. However, to keep the document to a more manageable size, the imagery has not been shown explicitly as this should be found in your school's agreed mental calculations policies.

The strategies used within this document are taken from the Lancashire Mathematics Team Progression in Mental Calculation Strategies Policies and the Progression Towards Written Methods Policies.

See [www.lancsngfl.ac.uk/curriculum/primarymaths](http://www.lancsngfl.ac.uk/curriculum/primarymaths) for the full policies.

Each strategy will require specific modelling (teaching) and sufficient practice for children to develop confidence, accuracy and fluency in performing them.

Children should also be taught when it is appropriate to use each strategy, by looking at the numbers involved and making effective decisions. Again, this is a sign of a child's fluency in mathematics; being able to recognise which strategy best suits a given calculation, rather than always using the same method regardless of the numbers involved.

### Acknowledgements

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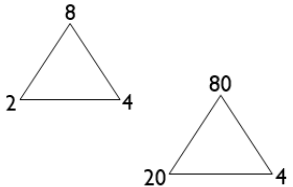
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## Arithmetic Expectations – Year 3

Skills	Examples
<b>Counting</b>	
<b>Find 1, 10 or 100 more or less than a given number.</b>	$229 + 1 = \underline{\quad}$ $229 + 10 = \underline{\quad}$ $229 + 100 = \underline{\quad}$ $200 = \underline{\quad} + 1$ $479 + \underline{\quad} = 480$ $726 + \underline{\quad} = 826$ $400 - 1 = \underline{\quad}$ $261 - 10 = \underline{\quad}$ $\underline{\quad} = 812 - 100$
<b>Count from 0 in multiples of 4, 8, 50 and 100</b>	Count from 0 in fours Count from 0 in eights What number is missing from this counting sequence? 0, 8, 16, 32, 40, 48 What number would come next in this counting sequence? 0, 50, 100, 150, 200, $\underline{\quad}$ What number comes immediately after 600 when counting up in steps of 100?
<b>Count up and down in tenths.</b>	Count on from 0 in tenths. What would come next in this counting sequence? 0, $\frac{1}{10}$ , $\frac{2}{10}$ , $\frac{3}{10}$ , $\frac{4}{10}$  What is missing from this number sequence? $\frac{7}{10}$ , $\frac{6}{10}$ , $\frac{5}{10}$ , $\frac{3}{10}$ , $\frac{2}{10}$
<b>Number Facts</b>	
<b>Recall addition and subtraction facts for 100 (multiples of 5 and 10).</b>	$100 - 30 = \underline{\quad}$ $20 + \underline{\quad} = 100$ $100 = \underline{\quad} + 5$ $100 - 45 = \underline{\quad}$ $100 - \underline{\quad} = 15$ $65 = 100 - \underline{\quad}$
<b>Recall and use multiplication division facts for the 3, 4 and 8 multiplication tables.</b>	$6 \times 3 = \underline{\quad}$ $2 \times 4 = \underline{\quad}$ $4 \times 8 = \underline{\quad}$ $20 = 4 \times \underline{\quad}$ $21 = 3 \times \underline{\quad}$ $32 = \underline{\quad} \times 8$ $\underline{\quad} \times 4 = 28$ $30 \div 3 = \underline{\quad}$ $24 \div 4 = \underline{\quad}$ $72 \div 8 = \underline{\quad}$ $3 = 36 \div \underline{\quad}$ $\underline{\quad} = 32 \div 4$ $\underline{\quad} = 48 \div 6$
<b>Mental Calculation Strategies - Addition and Subtraction</b>	
<b>Identify and use knowledge of number bonds within a calculation.</b> <i>Concrete – tens frames, Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings, number line</i>	$42 + 38$ $42 + 30 + 8$ (recognising that 2 and 8 is a number bond to 10, so the answer will be a multiple of 10) $60 - 28$ $60 - 20 - 8$ (using knowledge that $10 - 8 = 2$ , so $40 - 8 = 32$ ) $120 - 50$ $120 - 20 - 30$ (using knowledge of number bonds to 100, leaving an answer of 70)
<b>Derive and use addition and subtraction facts for 100</b> <i>Concrete – Diennes equipment, place value counters, beadstring</i> <i>Pictorial – Number line</i>	$100 - 43 = \underline{\quad}$ $22 + \underline{\quad} = 100$ $100 = \underline{\quad} + 9$ $100 - 76 = \underline{\quad}$ $100 - \underline{\quad} = 48$ $66 = 100 - \underline{\quad}$
<b>Derive and use addition and subtraction facts for multiples of 100 that total 1000</b> <i>Concrete – Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings</i>	$1000 - 300 = \underline{\quad}$ $200 + \underline{\quad} = 1000$ $1000 = \underline{\quad} + 500$ $1000 - 400 = \underline{\quad}$ $1000 - \underline{\quad} = 100$ $600 = 1000 - \underline{\quad}$
<b>Reorder numbers in a calculation.</b> <i>Concrete – tens frames, Diennes equipment, place value counters</i> <i>Pictorial – Diennes jottings, number line</i>	$23 + 54$ $54 + 23$ $12 + 19 + 12$ $12 + 12 + 19$ (using knowledge of doubles) $6 + 8 + 4$ $6 + 4 + 8$ (using knowledge of number bonds to 10) $70 + 50 + 30$ $70 + 30 + 50$ (using knowledge of number bonds to 100)

<p><b>Partition and combine multiples of hundreds, tens and ones.</b>  <i>Concrete – Diennes equipment, place value counters, beadstring</i>  <i>Pictorial – number line</i></p>	<p>526 + 200      counting on in hundreds  137 + 40        counting on in tens  272 + 8          counting on in ones (or using knowledge of bonds to 10)  428 – 200       counting back in hundreds  323 – 70        counting back in tens  693 – 8          counting back in ones  37 + 15          37 add 10 and 5 = 37 add 10 add 5 (crossing tens boundaries)  42 – 25          42 take away 20 and 5 = 42 take away 20 take away 5 (crossing tens boundaries)</p>
<p><b>Find differences by counting up through the next multiple of 10 or 100</b>  <i>Pictorial - number line</i></p>	<p>60 – 43    useful for time calculations, e.g. a journey time from 2:43 until 3:00  53 – 38    efficient because the numbers are close to each other  104 – 95   efficient because the numbers are close to each other  200 – 86   useful for money calculations, e.g. change from £2 when spending 86p</p>
<p><b>Bridge through 10 when adding or subtracting a single digit number (partitioning, e.g. 58 + 5 = 58 + 2 + 3 or 76 – 8 = 76 – 6 – 2 )</b>  <i>Pictorial - number line</i></p>	<p>35 + 7        as 35 + 5 + 2  97 + 6        as 97 + 3 + 3  178 + 5       as 178 + 2 + 3  42 – 7        as 42 – 2 – 5  204 – 6       as 204 – 4 – 2  371 – 5       as 371 – 1 – 4</p>
<p><b>Add or subtract 9, 19, 29 etc by rounding and compensating</b>  <i>Pictorial - number line</i></p>	<p>34 + 29       as 34 + 30 – 1  127 + 49      as 127 + 50 – 1  96 – 39        as 96 – 40 + 1  273 – 59       as 273 – 60 + 1</p>
<b>Mental Calculation Strategies – Multiplication and Division</b>	
<p><b>Derive and use doubles of all numbers to 100 and corresponding halves.</b>  <i>Concrete - Diennes equipment, place value counters</i>  <i>Pictorial – part – part – whole diagram</i></p>	<p>Double 46                  Halve 86  29 + 29                      Find half of 54  38 x 2                         92 ÷ 2</p>
<p><b>Derive and use doubles of all multiples of 50 to 500</b>  <i>Concrete - Diennes equipment, place value counters</i>  <i>Pictorial – part – part – whole diagram</i></p>	<p>Double 350  400 + 400  450 x 2</p>
<p><b>Multiply a one- or two-digit number by 10 and a one-digit number by 100</b>  <i>Concrete - Diennes equipment, place value counters</i>  <i>Pictorial - place value chart</i></p>	<p>3 x 10  7 x 100  62 x 10</p>
<p><b>Within known tables, use related facts to multiply T0 by a one-digit number NB T0 represents a two-digit multiple of ten.</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings</i></p>	<p>60 x 3  related to 6x3 because 60 x 3 = 10 x 6 x 3 which can be reordered to 6 x 3 x 10  50 x 4  related to 5 x 4 because 50 x 4 = 10 x 5 x 4 which can be reordered to 5 x 4 x 10  30 x 8  related to 3 x 8 because 30 x 8 = 10 x 3 x 8 which can be reordered to 3 x 8 x 10</p>

<p><b>Within known tables, use partitioning to multiply T1 by a one-digit number</b>  <i>Pictorial - Show array using squared paper.</i></p>	<p><math>31 \times 4 = 30 \times 4</math> add <math>1 \times 4</math> (said as 'thirty fours add one four')  <math>31 \times 4 = 120 + 4</math>  <math>31 \times 4 = 124</math></p> <p><math>61 \times 4</math>  <math>31 \times 8</math></p>
<p><b>Use compensation to multiply 19 by a one-digit number</b>  <i>Pictorial - Show array using squared paper.</i></p>	<p><math>19 \times 4 = 20 \times 4</math> subtract <math>1 \times 4</math> (said as 'twenty fours subtract one four')  <math>19 \times 4 = 80 - 4</math>  <math>19 \times 4 = 76</math></p> <p><math>19 \times 3</math>  <math>19 \times 5</math>  <math>19 \times 8</math></p>
<p><b>Use partitioning to double any two-digit number</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, part-part-whole diagram to double e.g. double 76</i></p>	<p>Double 39, double 52, double 85</p>
<p><b>Use related facts or partitioning to double any multiple of 50 to 500</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, part-part-whole diagram to double e.g. double 350</i></p>	<p>Double 250, double 450, double 150</p>
<p><b>Use related facts to divide T0 by a one-digit number</b>  NB T0 represents a multiple of ten  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, division trio e.g. <math>8 \div 2 = 4</math> then <math>80 \div 20 = 4</math></i></p> <div style="display: flex; align-items: center; justify-content: center;">  </div>	<p><math>60 \div 3</math> related to <math>6 \div 3</math>  <math>80 \div 40</math> related to <math>8 \div 4</math>  <math>90 \div 3</math> related to <math>9 \div 3</math></p>
<p><b>Use partitioning to halve even numbers up to 200</b>  <i>Concrete – Diennes equipment, place value counters</i>  <i>Pictorial – Diennes jottings, part-part-whole diagram to halve e.g. halve 154</i></p>	<p>Find half of 162 by partitioning into 160 and 2  Find half of 94 by partitioning into 80 and 14  Find half of 136 by partitioning into 120 and 16</p>

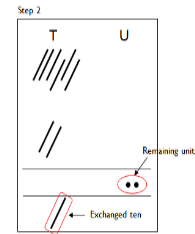
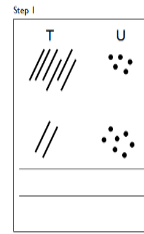
## Progression Towards Written Calculation Strategies – Addition

### Introduce column method of addition.

Concrete – Diennes equipment, place value counters (if necessary)

Pictorial – Diennes jottings in column (to illustrate place value of each digit)

$$65+27$$



Written method

Step 1	Step 2	Step 3																																																
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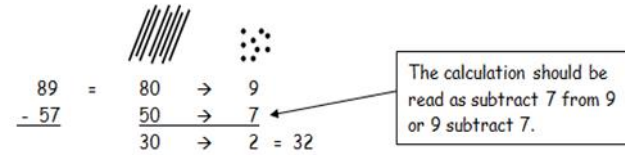
## Progression Towards Written Calculation Strategies – Subtraction

### Introduce column method of subtraction.

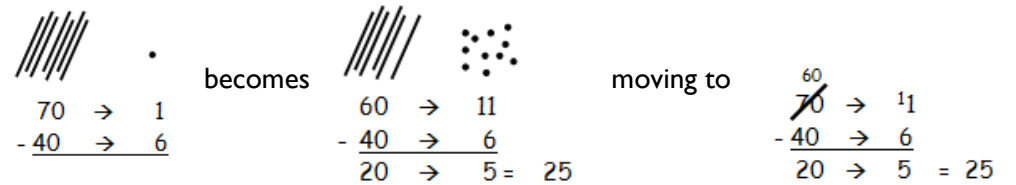
Concrete – Diennes equipment, place value counters (if necessary)

Pictorial – Diennes jottings in column (to illustrate place value of each digit)

$$89 - 57$$



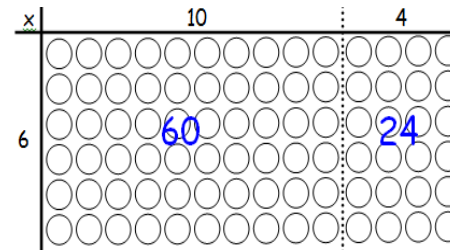
### Exchanging



## Progression Towards Written Calculation Strategies – Multiplication

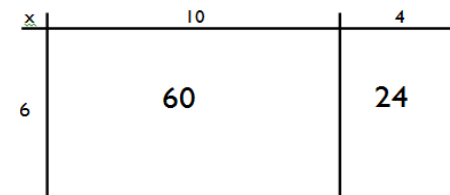
### Multiplication of a two digit number by a one digit number – grid method

Pictorial – rectangular arrays on squared paper



$$60 + 24 = 84$$

So  $14 \times 6 = 84$



$$60 + 24 = 84$$

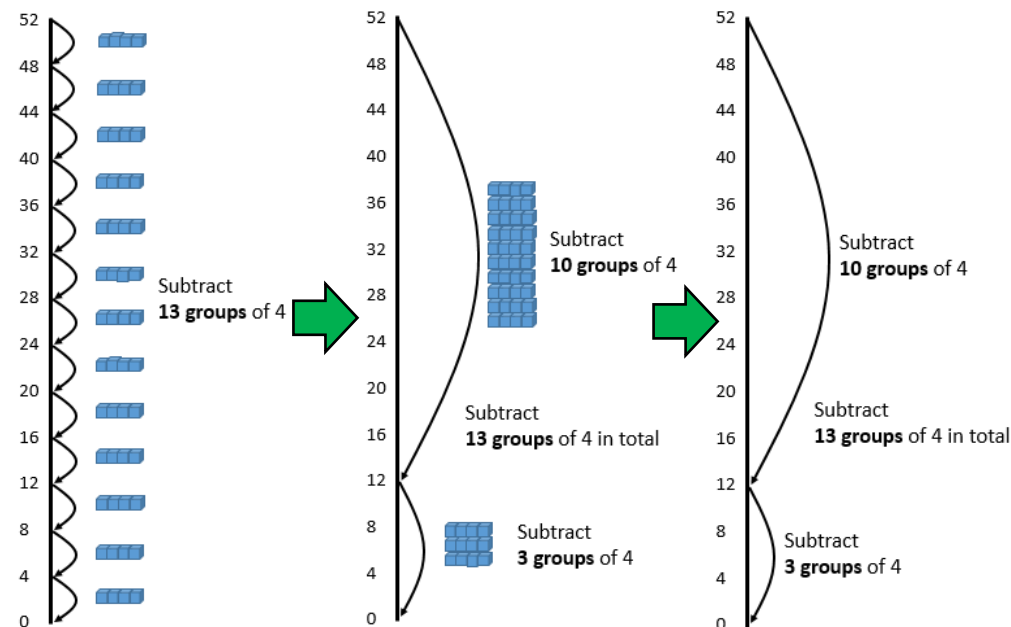
So  $14 \times 6 = 84$

## Progression Towards Written Calculation Strategies – Division

### Division using a vertical number line to show efficient repeated subtraction

Concrete – cubes, Diennes equipment

Pictorial – number line



### Decision Making

When calculating, children should ask themselves:

- do I know the answer because it is a fact I have learnt?
- can I work it out easily in my head?
- can I use some equipment or a jotting?
- do I need to use the written method?

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