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 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.

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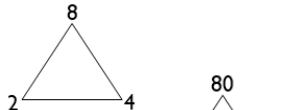
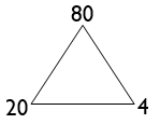
Arithmetic Expectations – Year 3

Skills	Examples
Counting	
Find 1, 10 or 100 more or less than a given number.	229 + 1 = __ 229 + 10 = __ 229 + 100 = __ 200 = __ + 1 479 + __ = 480 726 + __ = 826 400 – 1 = __ 261 – 10 = __ __ = 812 – 100
Count from 0 in multiples of 4, 8, 50 and 100	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, __ What number comes immediately after 600 when counting up in steps of 100?
Count up and down in tenths.	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? $\frac{7}{10}$, $\frac{6}{10}$, $\frac{5}{10}$, $\frac{3}{10}$, $\frac{2}{10}$
Number Facts	
Recall addition and subtraction facts for 100 (multiples of 5 and 10).	100 – 30 = __ 20 + __ = 100 100 = __ + 5 100 – 45 = __ 100 – __ = 15 65 = 100 – __
Recall and use multiplication division facts for the 3, 4 and 8 multiplication tables.	6 x 3 = __ 2 x 4 = __ 4 x 8 = __ 20 = 4 x __ 21 = 3 x __ 32 = __ x 8 __ x 4 = 28 30 ÷ 3 = __ 24 ÷ 4 = __ 72 ÷ 8 = __ 3 = 36 ÷ __ __ = 32 ÷ 4 __ = 48 ÷ 6
Mental Calculation Strategies - Addition and Subtraction	
Identify and use knowledge of number bonds within a calculation. *Concrete – tens frames, Diennes equipment, place value counters* *Pictorial – Diennes jottings, number line*	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)
Derive and use addition and subtraction facts for 100 *Concrete – Diennes equipment, place value counters, beadstring* *Pictorial – Number line*	100 – 43 = __ 22 + __ = 100 100 = __ + 9 100 – 76 = __ 100 – __ = 48 66 = 100 – __
Derive and use addition and subtraction facts for multiples of 100 that total 1000 *Concrete – Diennes equipment, place value counters* *Pictorial – Diennes jottings*	1000 – 300 = __ 200 + __ = 1000 1000 = __ + 500 1000 – 400 = __ 1000 – __ = 100 600 = 1000 – __
Reorder numbers in a calculation. *Concrete – tens frames, Diennes equipment, place value counters* *Pictorial – Diennes jottings, number line*	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)
Partition and combine multiples of hundreds, tens and ones.	526 + 200 counting on in hundreds

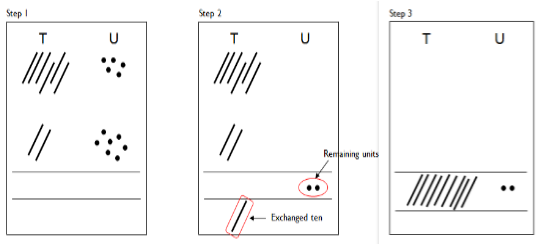
Concrete – Diennes equipment, place value counters, beadstring *Pictorial – number line*	137 + 40 counting on in tens 272 + 8 counting on in ones (or using knowledge of bonds to 10) 428 – 200 counting back in hundreds 323 – 70 counting back in tens 693 – 8 counting back in ones 37 + 15 37 add 10 and 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)
Find differences by counting up through the next multiple of 10 or 100 *Pictorial - number line*	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
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) *Pictorial - number line*	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
Add or subtract 9, 19, 29 etc by rounding and compensating *Pictorial - number line*	34 + 29 as 34 + 30 – 1 127 + 49 as 127 + 50 – 1 96 – 39 as 96 – 40 + 1 273 – 59 as 273 – 60 + 1
Mental Calculation Strategies – Multiplication and Division	
Derive and use doubles of all numbers to 100 and corresponding halves. *Concrete - Diennes equipment, place value counters* *Pictorial – part – part – whole diagram*	Double 46 Halve 86 29 + 29 Find half of 54 38 x 2 92 ÷ 2
Derive and use doubles of all multiples of 50 to 500 *Concrete - Diennes equipment, place value counters* *Pictorial – part – part – whole diagram*	Double 350 400 + 400 450 x 2
Multiply a one- or two-digit number by 10 and a one-digit number by 100 *Concrete - Diennes equipment, place value counters* *Pictorial - place value chart*	3 x 10 7 x 100 62 x 10
Within known tables, use related facts to multiply T0 by a one-digit number NB T0 represents a two-digit multiple of ten. *Concrete – Diennes equipment, place value counters* *Pictorial – Diennes jottings*	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

Within known tables, use partitioning to multiply T1 by a one-digit number *Pictorial - Show array using squared paper.*	31 x 4 = 30 x 4 add 1 x 4 (said as '*thirty fours add one four*') 31 x 4 = 120 + 4 31 x 4 = 124 61 x 4 31 x 8
Use compensation to multiply 19 by a one-digit number *Pictorial - Show array using squared paper.*	19 x 4 = 20 x 4 subtract 1 x 4 (said as '*twenty fours subtract one four*') 19 x 4 = 80 – 4 19 x 4 = 76 19 x 3 19 x 5 19 x 8
Use partitioning to double any two-digit number *Concrete – Diennes equipment, place value counters* *Pictorial – Diennes jottings, part-part-whole diagram to double e.g. double 76*	Double 39, double 52, double 85
Use related facts or partitioning to double any multiple of 50 to 500 *Concrete – Diennes equipment, place value counters* *Pictorial – Diennes jottings, part-part-whole diagram to double e.g. double 350*	Double 250, double 450, double 150
Use related facts to divide T0 by a one-digit number NB T0 represents a multiple of ten *Concrete – Diennes equipment, place value counters* *Pictorial – Diennes jottings, division trio e.g. 8 ÷ 2 = 4 then 80 ÷ 20 = 4*  	60 ÷ 3 related to 6 ÷ 3 80 ÷ 40 related to 8 ÷ 4 90 ÷ 3 related to 9 ÷ 3
Use partitioning to halve even numbers up to 200 *Concrete – Diennes equipment, place value counters* *Pictorial – Diennes jottings, part-part-whole diagram to halve e.g. halve 154*	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

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



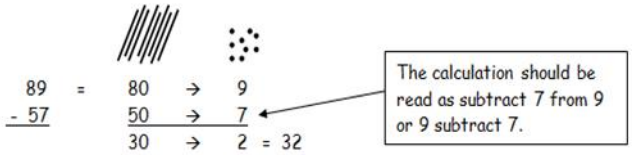
Written method

Step 1	Step 2	Step 3
T U	T U	T U
6 5	6 5	6 5
+ 2 7	+ 2 7	+ 2 7
	2	9 2
	1	1

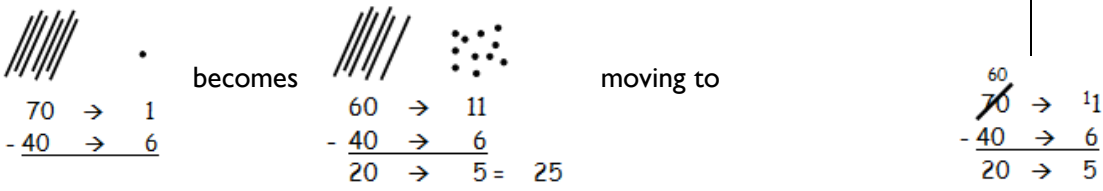
Progression Towards Written Calculation Strategies – Subtraction

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

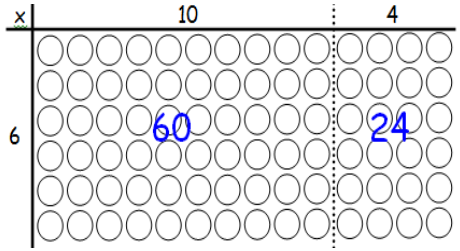


Exchanging

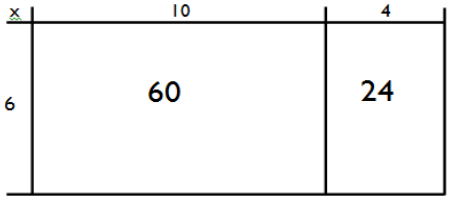


Progression Towards Written Calculation Strategies – Multiplication

Multiplication of a two digit number by a one digit number – grid method
Pictorial – rectangular arrays on squared paper



60 + 24 = 84
So 14 x 6 = 84



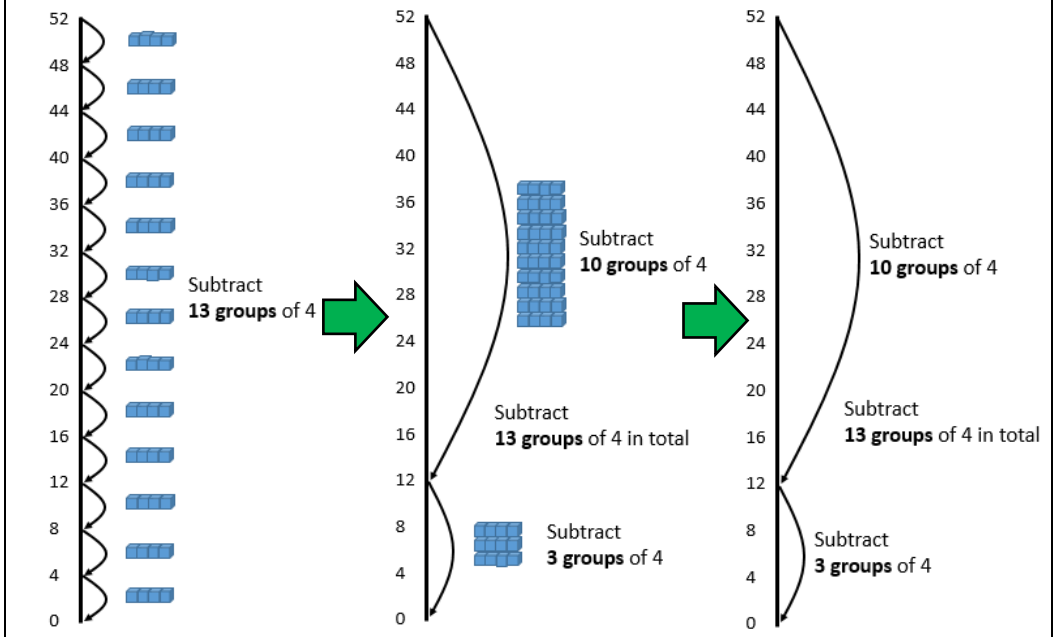
60 + 24 = 84
So 14 x 6 = 84

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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