

St. Andrew's C. P. School



Kirk Ella

Progression in Calculation

Part 1:
Addition and
Subtraction

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Introduction

This booklet covers the methods your child is taught with regards to addition and subtraction. We hope you find this useful when supporting your child with Maths at home.

Each section shows the progression of the methods used from Foundation Stage to Year 6. The sections build gradually from introducing addition and subtraction to formal written methods. They are not split into year group or age related expectations as all children progress at different speeds.

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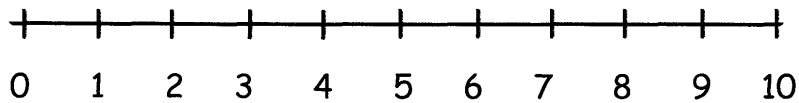
Progression in Addition

Addition up to 10

- Practical demonstrations of adding, counting objects and combining sets.
- Pictorial representations of adding, counting objects and combining sets.
- Vocabulary of addition and subtraction.
- Introduction of number lines/ 100-squares for recording 'jumps'.

E.g. 4 add 2 makes 6

Number line



Hundred-square /100-Square

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Encourage mental calculations.
- Record simple additions in number sentences using + sign.

E.g. $4 + 2 = 6$

Addition up to 20

- Practically using objects, beads, cubes etc.
- Use of tens and units apparatus.
- Using a number line 0 - 20 to move along starting with the largest number.
- Using a 100-square, move along starting with the largest number.
- Mentally adding numbers up to 20 without apparatus.
- Recording mental additions in a number sentence using + sign.

Addition above 20

- Using a 100-square and/or number line to 100, add 2 digit and 1 digit numbers
- E.g. $35 + 6 = 41$
- Then add 2-digit numbers and multiples of 10.
- E.g. $72 + 20 = 92$

Using a 100-square, either

a) start with the highest number and partition the 2nd number into tens and units then recombine

E.g. $54 + 15 = 69$

$$54 + 15 =$$

$$54 + 10 = 64$$

$$64 + 5 = 69$$

or b) partition both numbers into tens and units, add and recombine

eg $54 + 15 = 69$

$$54 + 15 = 69$$

$$50 + 10 = 60$$

$$4 + 5 = 9$$

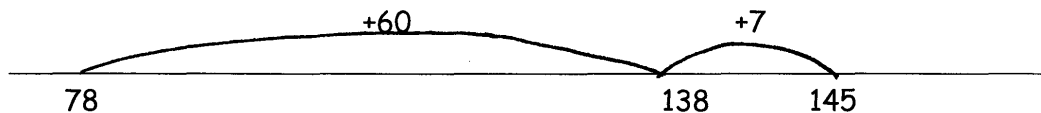
$$9 + 60 = 69$$

- Move onto mentally splitting the numbers into tens and units and recombining without any apparatus.
- Record additions in number sentences. E.g. $54 + 15 = 69$

Addition above 20 continued...

- When a child no longer needs the visual aid of a 100-square they can move onto using a numberline with 10s marked on, then a blank number line to record jumps.

E.g. $78 + 67 = 145$



- Begin to record calculations in preparation for vertical addition:

E.g. $76 + 27 = 103$

$$\begin{array}{r} 76 \\ + 27 \\ \hline \end{array} =$$

$$\begin{array}{r} 76 \\ + 20 \\ \hline \end{array} = 96$$

$$\begin{array}{r} 96 \\ + 7 \\ \hline \end{array} = 103$$

E.g. $85 + 49 = 134$

$$\begin{array}{r} 85 \\ + 49 \\ \hline \end{array} =$$

$$\begin{array}{r} 85 \\ + 40 \\ \hline \end{array} = 125$$

$$\begin{array}{r} 125 \\ + 9 \\ \hline \end{array} = 134$$

or E.g. $68 + 24 = 92$

$$\begin{array}{r} 68 \\ + 24 \\ \hline \end{array} =$$

$$\begin{array}{r} 60 \\ + 20 \\ \hline \end{array} = 80$$

$$\begin{array}{r} 8 \\ + 4 \\ \hline \end{array} = 12$$

$$\begin{array}{r} 80 \\ + 12 \\ \hline \end{array} = 92$$

- Develop ability to do this mentally without the need for recording the working out.

Progression in Addition: Column Addition

Expanded Column Addition

- Without crossing the 10s boundary

E.g. $68 + 21 = 89$

$$\begin{array}{r} 68 \\ + 21 \\ \hline 9 \text{ add units} \\ 80 \text{ add tens} \\ \hline 89 \text{ add tens and units} \end{array}$$

- Crossing the 10s boundary

E.g. $68 + 26 = 94$

$$\begin{array}{r} 68 \\ + 26 \\ \hline 14 \text{ add units} \\ 80 \text{ add tens} \\ \hline 94 \text{ add tens and units} \end{array}$$

- Crossing 10s and 100s boundaries

E.g. $387 + 444 =$

$$\begin{array}{r} 387 \\ + 444 \\ \hline 11 \text{ add units} \\ 120 \text{ add tens} \\ 700 \text{ add hundreds} \\ \hline 831 \text{ add units, tens and hundreds} \end{array}$$

Compact Column Addition

- Without crossing the 10s boundary

E.g. $68 + 21 = 89$

$$\begin{array}{r} 68 \\ + 21 \\ \hline 89 \end{array}$$

- Move on to adding 3-digit numbers without crossing the 10s boundary.

Then onto:

- Crossing the 10s boundary

E.g. $345 + 237 = 582$

$$\begin{array}{r} 345 \\ + 237 \\ \hline 582 \end{array}$$

- Crossing 10s and 100s boundaries

E.g. $387 + 444 = 831$

$$\begin{array}{r} 387 \\ + 444 \\ \hline 831 \end{array}$$

- Move on to adding 4 and 5-digit numbers as above.

- Move on to adding more than two numbers.

E.g. $538 + 465 + 239 = 1242$

$$\begin{array}{r}
 538 \\
 465 \\
 + 239 \\
 \hline
 1242
 \end{array}$$

- Include decimals and different numbers of digits.

E.g. $22.4 + 17.8 = 40.2$

E.g. $2734 + 361 = 3095$

$$\begin{array}{r}
 22.4 \\
 + 17.8 \\
 \hline
 40.2
 \end{array}$$

$$\begin{array}{r}
 2734 \\
 + 361 \\
 \hline
 3095
 \end{array}$$

Progression in Addition Vocabulary

more

add, addition

sum

total

altogether

one more, two more, ten more...

how many more to make...?

equals

sign, plus

increase

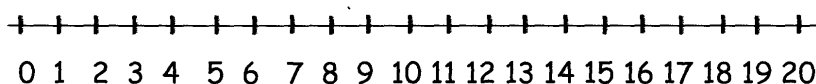
Progression in Subtraction (counting back)

Subtraction up to 20

- Use of songs and nursery rhymes.
- Practically using objects, beads, cubes etc
- Using a number line 0 - 20 to move along starting with the highest number and counting back the correct number of spaces.

E.g. $19 - 7 = 12$

From 19 count back 7 places to reach 12.



- Using a 100-square move along starting with the highest number and counting back the correct number of spaces.

E.g. $19 - 7 = 12$

From 19 count back 7 places to reach 12.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Move on to mentally subtracting the numbers without apparatus.
- Use a 100-square and/or number line to 100 to subtract a 1-digit number from a 2 digit number. E.g. $35 - 6 = 29$
- Subtract a multiple of 10 from a 2-digit number. E.g. $72 - 20 = 52$

Subtraction above 20 using 100-square

- Using a 100-square starting with the highest number and count back to the lower number. Count back in tens then back in units.

E.g. $45 - 26 = 19$

Start at 45, back 2 tens to 25, then back 6 units to 19.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Move onto mentally subtracting the numbers without apparatus.

Subtraction above 20 using 0-100 numberline

- Using a 0 - 100 number line starting at the highest number and counting back the tens then units.

E.g. $45 - 26 = 19$

Start at 45 count back 2 tens then 6 units.

Begin to record:

$$45 - 26 =$$

$$45 - 20 = 25 \quad \text{Start at 45 count 2 tens to 25.}$$

$$25 - 6 = 19 \quad \text{From 25 count back 6 units to 19.}$$

- Move on to mentally subtracting the numbers without apparatus.

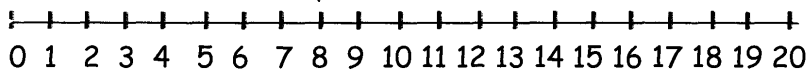
Progression in Subtraction (counting on)

Subtraction up to 20

- Use of songs and nursery rhymes.
- Practically using objects, beads, cubes etc
- Using a number line 0 - 20 to move along starting with the lowest number and count up the higher number.

E.g. $19 - 7 = 12$

From 7 count on 12 places to reach 19.



- Using a 100-square to move along starting with the lowest number and counting up to the higher number.

Eg $19 - 7 = 12$

From 7 count on 12 places to reach 19.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
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71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- Use addition knowledge to mentally subtract numbers within 20 without apparatus.
- Understand that subtraction is the inverse of addition with the use of number stories.

E.g. Three numbers 7, 12, and 19 will give 4 stories:

$$7 + 12 = 19$$

$$12 + 7 = 19$$

$$19 - 7 = 12$$

$$19 - 12 = 7$$

Subtraction above 20 using 100-square

- Using a 100-square start with the lowest number and count up to the higher number. Count on in units to the next multiple of ten, then on in tens.

E.g. 100 - 37

Start at 37 across 3 units to 40 then 6 tens to 100 = 63

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

$$37 \rightarrow 40 = 3$$

Start at 37 count on to 40.

$$40 + 60 = 100$$

From 40 count on to 100.

$$3 + 60 = 63$$

Add the amounts together.

- Understand that subtraction is the inverse of addition.
- Moving onto mentally subtracting the numbers.

Subtraction above 20 using 0-100 numberline

- Using a 0 - 100 number line starting at the lowest number and up to the highest number.

E.g. 100 - 37 = 63

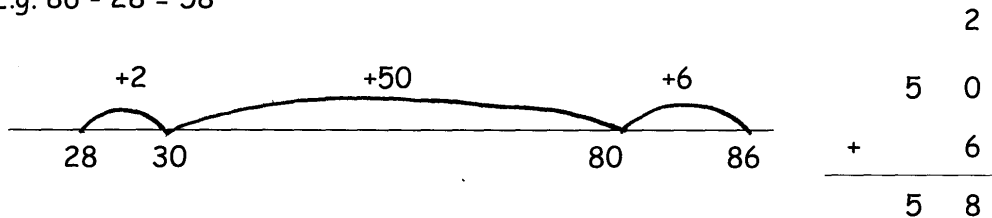
Start at 37 count up 3 units to 40, then 6 tens to 100. Add the 3 units and 6 tens together.

Subtraction using a blank numberline

- When a child no longer needs the visual aid of a 100-square or labelled numberline they can move onto using a blank number line to record jumps.

Use vertical addition to add if necessary.

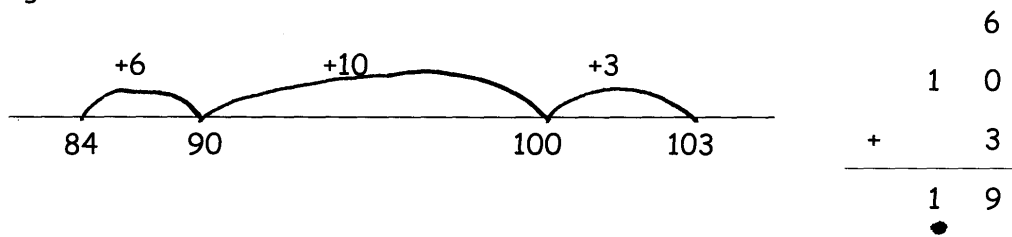
E.g. $86 - 28 = 58$



Subtraction using a blank numberline

- Crossing the 100s boundary.

E.g. $103 - 84 = 19$

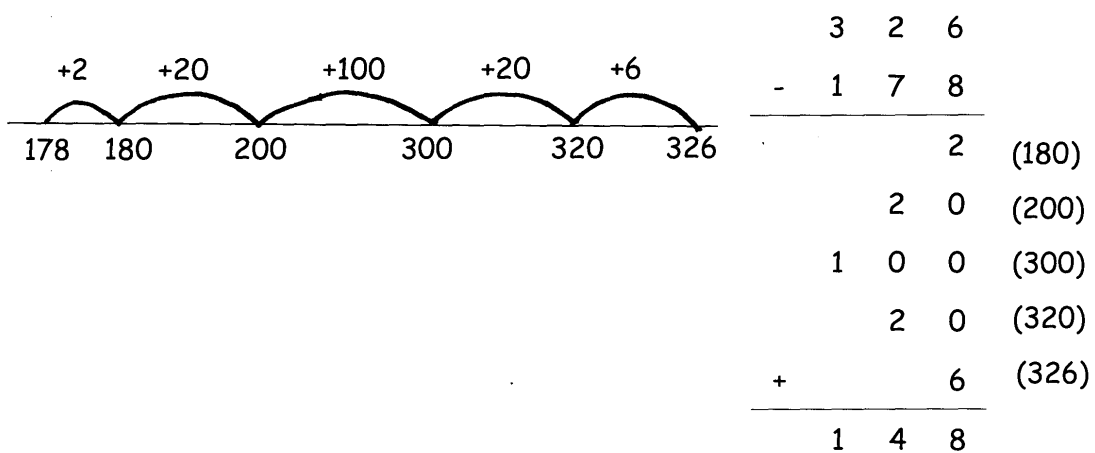


Subtraction using a blank numberline

- Extend to 3-digit numbers.

Begin to model vertical recordings for the jumps alongside the numberline.

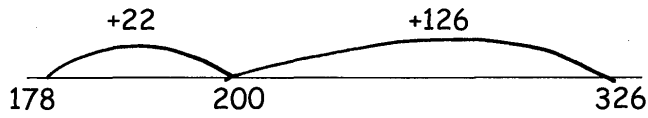
E.g. $326 - 178 = 148$



Subtraction using a blank numberline

- Leading to a smaller number of jumps on the numberline.

E.g. $326 - 178 = 148$



$$\begin{array}{r} 326 \\ - 178 \\ \hline 22 \quad (200) \\ + 126 \quad (326) \\ \hline 148 \end{array}$$

- When children no longer need the numberline they can use the vertical recordings for the jumps.

Progression in Subtraction: Column Subtraction

- Without any exchanges

E.g. $36 - 24 = 12$

$$\begin{array}{r} 36 \\ - 24 \\ \hline 12 \end{array}$$

E.g. $236 - 124 = 112$

$$\begin{array}{r} 236 \\ - 124 \\ \hline 112 \end{array}$$

Column Subtraction

- With one exchange (decomposition)

E.g. $36 - 27 =$

$$\begin{array}{r} \overset{2}{\cancel{3}}6 \\ - 27 \\ \hline 09 \end{array}$$

- Move on to 3 digit numbers with one exchange

Column Subtraction

- With two exchanges.

E.g. $235 - 167 =$

$$\begin{array}{r} \overset{1}{\cancel{2}}\overset{12}{\cancel{3}}5 \\ - 167 \\ \hline 068 \end{array}$$

- Extend to use of 4 and 5-digit numbers.

Column Subtraction

- Include decimals and different numbers of digits.

E.g. $22.4 - 17.8 = 4.6$

E.g. $2734 - 361 = 2373$

$$\begin{array}{r} \cancel{2} \cancel{2} . 4 \\ - 17 . 8 \\ \hline 04 . 6 \end{array}$$

$$\begin{array}{r} 2 \cancel{7} 3 4 \\ - \quad 361 \\ \hline 2373 \end{array}$$